AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

APRIL 1, 1960

Features • • •

LATEST METHODS AT PLYMOUTH PLANT

HIGHLIGHTS OF AUSTIN PRODUCTION

AUTOMOTIVE USES FOR WELDING

PROGRAM FOR RELIABILITY AT CARBURETOR PLANT

Directors of Imperial Quality

Left to right, Imperial plant executives are: Charles R. Lautz, production manager: Raymond E. Hewlett, manufacturing engineer; Frederick A. Stewart, manager quality control; and G. T. Poirier, Imperial plant manager.

PAGE 33



MANAGEMENT · PRODUCTION DESIGN

Allis-Chalmers uses

RYKON Grease

in bearing shield

-offers farmers

better disc harrow

Can RYKON Grease help you improve your product? Situation: Bearings of a disc harrow in service are always turning in dusty conditions, oftentimes completely covered with soil. Such bearings in the Allis-Chalmers harrow are protected with grease-coated rubber shields. The grease guards against dirt getting past the shield and into the bearing.

What was done: Allis-Chalmers project engineer in the LaCrosse, Wisconsin plant, Maynard Walberg, called Fred Parkinson, Standard Oil lubrication specialist, for a sample of Rykon Grease. In conditions simulating field service, Rykon Grease was tested. Bearings were rotated in the most abrasive dirt available—Mississippi sand with a high quartz fraction.

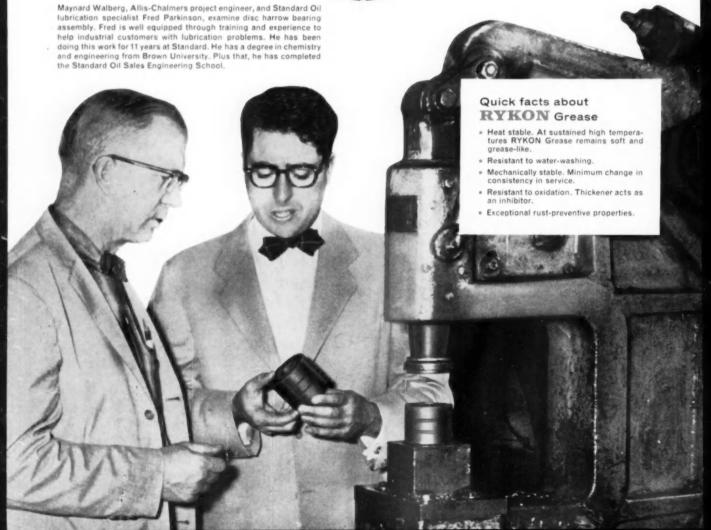
What happened: Tests were started and run to destruction. Prior to the use of Rykon Grease, bearing failures occurred at 500 hours. On switching to Rykon Grease, these tests were pushed to 2,000 hours. At this point, tests were stopped. Bearings were still in operating condition.

What you can do: Find out how RYKON Grease might help you offer your customers a better product. Inquire of the Standard Oil lubrication specialist nearest you anywhere in the 15 Midwest or Rocky Mountain states. Or write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

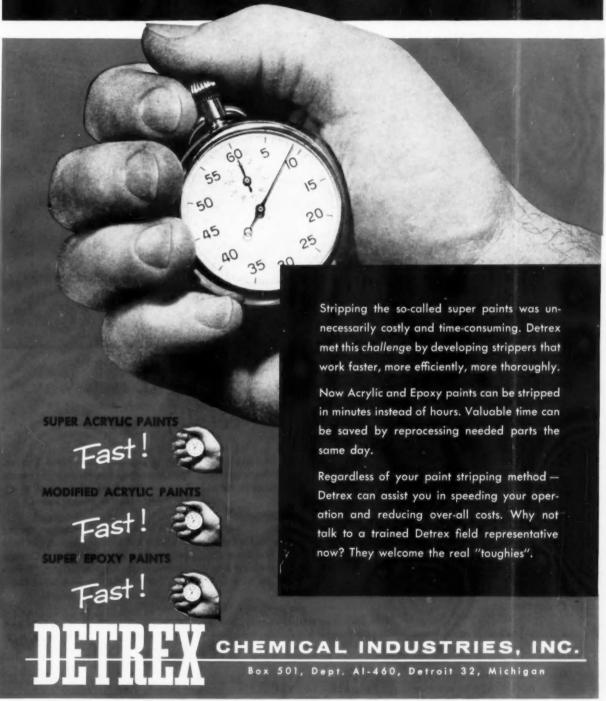
You expect more from



and you get it!



Now You Can Time Paint Stripping With a Stopwatch





Double-Layer Nickel Plating-bright, new way to give a car sales (and resale) appeal

Long will her trim stay bright and shiny! For under that mirror-like topcoat of chrome on the 1960 Dodge there's a double layer of Nickel Plating.

That's right! Not one, but two layers of Nickel under the chrome. The first is a layer of semi-bright Nickel to provide a leveling base, a smooth metal foundation. The second is a fully bright layer to provide the lustrous base needed for a gleaming chrome finish.

It's the double layer of Nickel that actually makes possible the lasting brilliance of the finish. You see, doublelayer Nickel Plating works two ways: It acts as a cushion against stone or gravel nicks, traffic scratches and abrasions, exhaust fumes and de-icing salts. What's more, it shields the basis metal against rust and corrosion.

It's truly "The Finish of Lasting Beauty". So rich and lustrous, it's bound to earn an appreciative nod from the new car buyer . . . so durable and practical, it just naturally adds to a car's trade-in and resale value.

With Nickel in ample supply, now is the time for you to look into the advantages of double-layer Nickel Plating. Plan to use this quality finish to put an I-want-it gleam into the eye of every car buyer - and to keep it there!

For information on corrosion testing of plated coatings and how it can help assure the quality of Nickel-Chrome finishes, write for our booklet, "Corrosion Testing of Electrodeposited Coatings". It's yours for the asking.

TheInternational Nickel Company, Inc. 67 Wall Street New York 5, N. Y.

AUTOMOTIVE INDUSTRIES, April 1, 1960



AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE . PUBLISHED SEMI-MONTHLY

APRIL 1, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories Production and Processing Equipment Design • Production • Engineering • Management VOL. 122 No. 7

Features • •

Chrysler Imperial Quality at Work

This article discusses one of the most important parts of any production operation -quality control. G. T. "Tom" Poirier describes this activity at the Chrysler Imperial Plant. Page 33

Welding-Primary Production Methods

This well illustrated article discusses different phases of resistance welding operations, processes, and equipment. This is part four of a five-part article by Andrew Shearer.

Latest Production Methods at Plymouth Assembly Plant

Extensive changes in final assembly techniques at the Plymouth plant are described and illustrated in an article by Joseph Geschelin, Detroit editor. New conveyor and painting systems are included in this coverage. Page 44

Austin Production Highlights

This is the final installment of a two-part

article. Part one appeared in the March 1 issue of AUTOMOTIVE INDUSTRIES. This series is by David Scott. Page 47

Reliability Program

The Rochester Products Div. of General Motors Corp. has introduced an intensive program to improve their quality control methods. Joseph Geschelin discusses this control system in a comprehensive article. Page 50

Machine Tool Builders Report Steady Business Trend

Charles A. Weinert, Eastern Editor, covers the machine tool industry in an interesting and informative article. Comparison to other years, backlogs, and future prospects are all discussed. Page 61

16 New Product Items and Other Features Such as:

Machinery News, Metals, Airbriefs, and Our Washington Wire.

... continued on next page

MEMBER =



Copyright 1960 by Chilton Company

National Business Publications, Inc.



BPA Business Publications
Audit of Circulation

AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly) May 1902; Degler, and Repairman (monthly), October, 1903; the Automobile Magazine (monthly) July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918 EDITORIAL EXECUTIVE OFFICES, Chestnut and 56th Nts. Philadelphia 39, Pa., U. S. A. Cable address—Autoland, Philadelphia.

AUTOMOTIVE INDUSTRIES. Published semi-monthly by Chilton Company, Chestnut & 56th Sts., Phila. 39. Second Class Postage Paid at Philadelphia, Pa. Subscription price To manufacturers in and suppliers to the automotive industries in the U. S., U. S. Possessions and Canada, \$2.00 per year; \$3.00 for 2 years. All Others, \$10.00 per year Single copies, 504. Statistical Issue \$2.00 and Products Guide Issue, \$1.00 net.

AUTOMOTIVE

J	ews Previews • • •	
	GM Planning Smaller Models for '61	17
	Diamond T Introduces Fiberglass Tilt Cabs	18
	Goodyear Chemical Combats Tire Cracking	18
	Isbrandt Elected Head of AMA Committee	18
	AMC to Build Plant Near Toronto	19
	VW Imports Wagons, Trucks From Brazil	19
	San Jose Plant Making Only Falcons	19
	Churchill Predicts Prosperous Year	19
	Hupp Income, Sales Up 270 and 35 Pct	20
	Economist Hails Business Outlook	20
	Rockwell-Standard Sets Earnings Record	20
	Automotive Sales Aid Wagner's Record Year	24
	Clevite's Profits More than Doubled	24
		25
	World's Largest Broach at GMC Truck Engine Plant	25
	Tractor Sales Increase Yale & Towne Profits	
	Aluminum Engines Common in Europe	26
	Corvair's Manza Expected in Month	26
	A-C Net Increases to \$22.4 Million	27
	AMC Buys Land for Employee Parking	27
	Triumph's Compact to Bow at New York Show	27
	J&H Net Is \$640,000 Despite Five-Month Strike	27
)	epartments • • •	
	Calendar of Coming Events	8
	Letters to the Editor	13
	News of the Automotive and Aviation Industries By Hugh C. Quinn and C. B. Campbell	17
	Tabloid	24
	Men in the News	29
	Editorial Page. By Hartley W. Barcley	31
	Automation News Report, By C. J. Kelly	65
	Machinery News. By Charles A. Weinert	68
	Industry Statistics	71
	New Plant and Production Equipment	72
	New Automotive and Aviation Products	77
	Metals. By William Boericke	82
	Airbriefs. By R. Raymond Kay	84

Advertisers Index

HARTLEY W. BARCLAY, Editor and Publisher JOHN F. PFEFFER, Assistant Publisher H. H. ROBERTS, Engineering Editor

EDITORIAL STAFF

C. B. CAMPBELL, News Editor
ROBERT P. HOMER, Editorial Production Mgr.
CORNELIUS J. KELLY, Assistant Editor
NORMAN M. LLOYD, Markets Editor
MARCUS AINSWORTH, Statistical Editor
HAROLD M. NELSON, Specifications Editor
HOWARD KOHLERENNER, Art Director
JANE LIVINGSTON, Products Guide Editor
Assistants—Inza Sherburne, Phyllis Kirsch

DETROIT

Joseph Geschelin, Detroit Editor

Hugh C. Quinn, Regional News Editor

PHILADELPHIA & NEW YORK
Charles A. Weinert, Eastern Editor

WASHINGTON George H. Baker, Washington Editor Neil R. Regelmbal, Wash. News Editor Raiph W. Crosby, Wash. News Editor

CHICAGO
Kenneth Rose, Mid-West Editor

LOS ANGELES
R. Raymond Kay, Pacific Coast Editor
LONDON

David Scott, British Correspondent

ERN Robert S. Braunschweig. European Correspondent

Paul Wooton, Washington Member, Editorial Board Robert Gunning, Readability Consultant

As part of its worldwide automotive and aviation news coverage AUTOMOTIVE INDUSTRIES is serviced by United Press International and has editorial correspondents in major United States and Foreign industrial centers.

All unsolicited and contributed articles submitted without advance approval by the editors are sent entirely at the author's risk and the editors will not be responsible for safekeeping or prepaid postage return of such materials or photographs.

BUSINESS DEPARTMENT

E. H. Miller, Advertising Mgr. James Cadagan, Circulation Mgr. John H. Kofron, Research Director John Davis, Marketing Research

REGIONAL MANAGERS

CHICAGO—Carl A. Zehner 360 North Michigan Ave., Chicago 1, III., Phone RAndolph 6-2166

Detroit 2, Mich., Phone TRinity 3-7800

PHILADELPHIA and NEW YORK—Nelson W. Sieber, Chestnut & 56th Sts., Philadelphia 39, Pa. Phone Stlerwood 8-2000; and 100 East 42nd St., New York 17, N. Y., Phone Oxford 7-3400

CLEVELAND—George Kilbride 930 B. F. Keith Bldg., Cleveland 15, Ohio., Phone SUperior 1-2860

DALLAS—William J. Smyth 189 Meadows Bldg., Dallas 6, Tex., Phone EMerson 8-4751

SAM FRANCISCO—Frank W. McKenzie 1355 Market St., San Francisco 3, Calif., Phone UNderhill 1-9737

LOS ANGELES—L. H. Jackson 198 S. Alvarado St., Los Angeles 57, Calif., Phone DUnkirk 7-4337

ATLANTA—John W. Sangston 32 Peachtree St., N. E., Atlanta 3, Ga., Phone JAckson 3-6791

CHILTON COMPANY OFFICERS AND DIRECTORS

G. C. Buzby—President
P. M. Fahrendorf, L. V. Rowlands, Robert E.
McKenna, George T. Hook—Vice Presidents
William H. Vallar—Treasurer
Maurice E. Cox, Frank P. Tighe, Everlt B.
Terhune, Jr., Russell W. Case, Jr., Charles A. S.
Heinle, and John H. Kofron.

Stanley Appleby—Comptroller

AUTOMOTIVE INDUSTRIES is one of the Publications Owned by CHILTON COMPANY. Executive Offices, Chestnut & 56th Sts., Philadelphia 39, Pa., U. S. A.



"LEADER IN BRAKE RESEARCH AND TESTING"

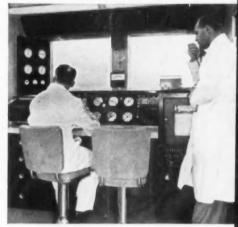
BENDIX MOBILE LABORATORY prepares to take to the highway in the interests of better braking and greater highway safety. Aboard is every scientific instrument needed to measure brake design and performance from every possible angle.

To add even more depth to its research and testing of brakes and power brakes, Bendix Products Division now operates a unique mobile laboratory to gather the most complete braking data ever assembled.

Equipped with the latest in scientific brake test instruments, the Bendix Mobile Laboratory will travel more than 100,000 miles per year making tests under all kinds of driving conditions, over all kinds of roads. It will thoroughly "road check" new brake designs and developments in weather ranging from 30° below zero in Minnesota to 110° in the Arizona desert.

A permanent record of each test run is being maintained for complete study and analysis. Special instruments aboard measure such factors as speed and stopping distance; temperatures of lining, drums, wheel rims, and hydraulic fluid; speed of brake applications and time lag between trailer and tractor brakes; stroke of master and wheel cylinders; and pressure and displacement input to brakes.

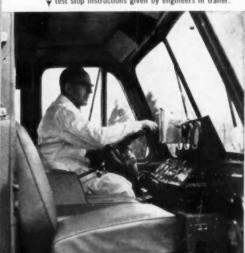
No one else in the world does as much brake research and development work as Bendix—"Brake Headquarters of the World." Why not put this experience to work for you!



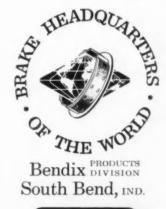
TEST RESULTS for each run can be checked visually by Bendix engineers during stops and are also recorded permanently on 25-channel oscillograph for detailed study later. Two-way radio (right) permits conversation with tractor driver and with South Bend headquarters.



CAB OF TRACTOR in tractor-trailer combination carries supplementary instrumentation to that in trailer, so that driver can maintain complete control in line with test stop instructions given by engineers in trailer.



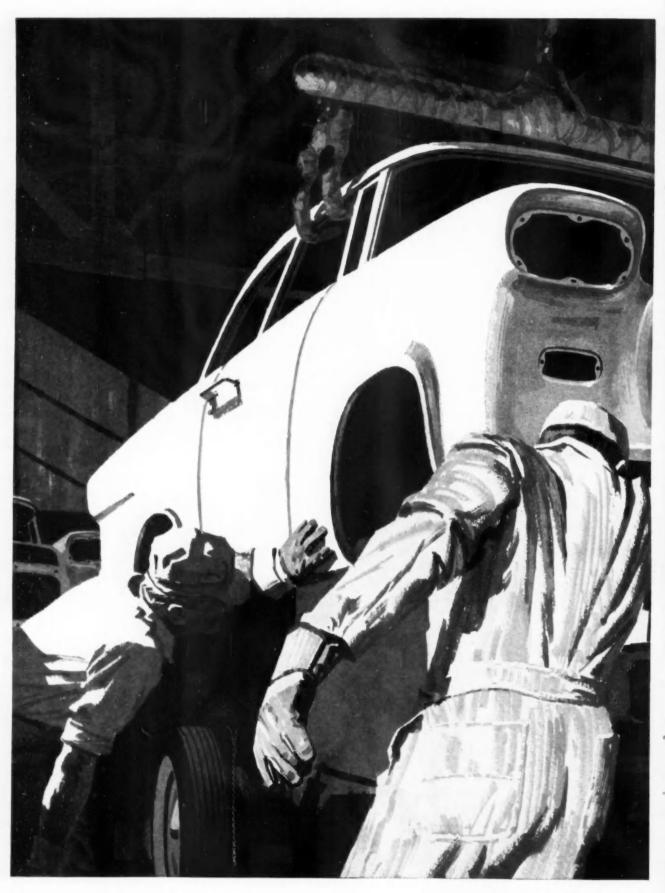
PART OF LARGE FLEET of Bendix brake test vehicles operated by Bendix Automotive Engineering, Research, Development and Road Test Departments. Much of work is done in mountainous country, Bendix also maintains large test facility at Jennerstown, Pa.





MOBILE LABORATORY NO. 2 is also used to test brakes and power brakes in all kinds of weather over all kinds of terrain. Trailer interior houses battery of instruments for checking and recording results of test runs.





6

Automotive Industries, April 1, 1960



the strong silent type

Body and chassis welded together into one strong, light, noise-free unit—that's the increasingly popular unit body construction used in many of today's cars. Result—not only the absence of squeaks and rattles but also added strength for extra safety...with less weight.

Budd designed, engineered and constructed the first unit body to be put into production in the U.S.A. in 1939. Its currently growing popularity is proof of the foresight with which Budd facilities are being applied to serve the automotive industry. The Budd Company, Detroit 15.



Since 1916—serving the automotive industry with research, design, engineering and specialized production facilities.



COLOR CALENDAR

OF COMING SHOWS AND MEETINGS

- Nuclear Congress and Atomic Exposition, New YorkApr. 4-7
- SAE 11th Annual Earthmoving Industry Conference, Peoria, III. Apr. 5-6
- SAE National Aeronautic Meeting, New YorkApr. 5-8
- SPI Western Section Conference, Palm Springs, Calif.Apr. 7-8

- Annual Conference on Automatic Techniques, Cleveland Apr. 18-19
- American Machine Tool Distributors' Assn., Spring Meeting, White Sulphur Springs Apr. 18-20

- SPI Cellular Plastics Div., Automotive Conference, Detroit ... Apr. 20-21
- American Society of Tool and Manufacturing Engineers, Tool Show, DetroitApr. 21-28
- ASME Maint. and Plant Engineering Conference, St. Louis .. Apr. 25-26
- AWS, 41st Annual Meeting and Welding Show, Los Angeles Apr. 25-29

- American Foundrymen's Society,
 Casting Congress and Exposition, Phila. May 9-13
- 8th International Automobile Technical Congress, The Hague.. May 9-13

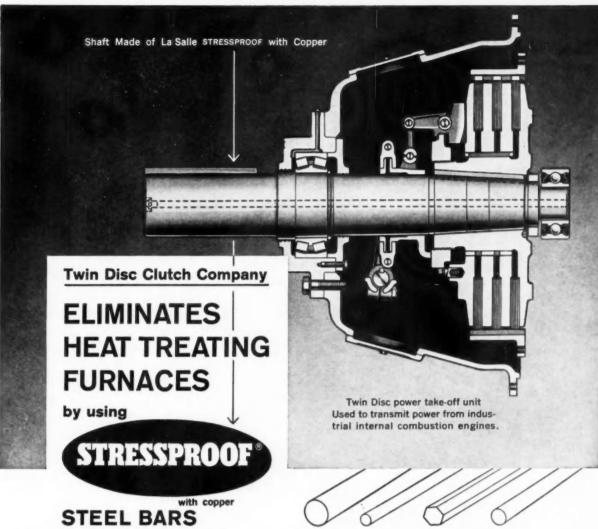
- SAE Summer Meeting, Chicago June 5-10
- AGMA (Gear Mfrs.) Annual Meeting, Hot Spring, Va.June 6-8
- Machine Tool Exposition 1960 (sponsored by National Machine Tool Builders' Assn.), Chicago Sept. 6-16

DISCERNING DRAFTSMEN THE WORLD OVER DEMAND IMPERIAL THE WORLD'S FINEST TRACING CLOTH

Circle 109 on Inquiry Card for more data

303 Morrell St., Elizabeth 4, N. J.
"The Original Marking Specialists"

Circle 108 on Inquiry Card for more data



Wisconsin, Twin Disc Clutch Co. saved mo

In Racine, Wisconsin, Twin Disc Clutch Co. saved money on a plant addition by eliminating heat treating furnaces . . . and they continue to save on part costs by using a material which needs no heat treatment . . . STRESSPROOF.

On the strength of over 15 years' experience with STRESSPROOF, Twin Disc knew they could cut their costs by purchasing this material which has the necessary properties in the bar.

They produce about 150 different models of power take-off shafts . . . see cross-section drawing. These shafts must possess great toughness and have the strength to take heavy loads. They must resist wear at the journals. Because one end of each shaft must be machined to individual customer specifications, machinability is important. Warpage after machining cannot be tolerated.

STRESSPROOF with copper fills these requirements on all counts because it has these four qualities in the bar: (1) Strength without heat treating. (2) Machinability (copper further improves machinability). (3) Excellent resistance to wear. (4) Minimum warpage.

By using STRESSPROOF, Twin Disc eliminates the cost of heat treating, cleaning and straightening. Working conditions are better . . . the plant is cleaner and cooler, and floor space requirements are less. Time and money consuming production steps are eliminated.

Twin Disc gets better parts at lower cost, and perhaps you can profit by their experience. Unless you have investigated STRESSPROOF recently, you may be overlooking worthwhile savings, especially since copper has now been added to improve machinability.

Available from your Steel Service Center.

La Salle STEEL COMPANY

1438 150th Street, Hammond, Indiana

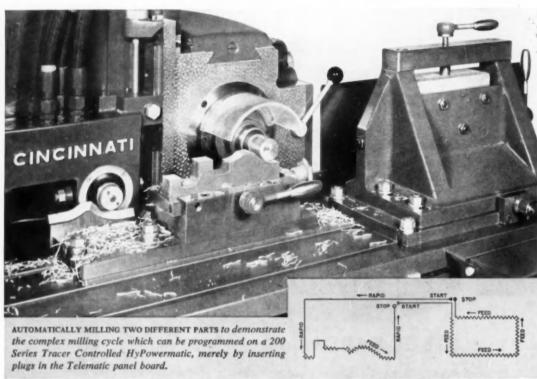


Piease se	nd literature	describing	La :	Salle	STRESSPROOF	with	copper.
name							
title							
company_							
address_							
city		70	ne		state		

New 100 and 200 series

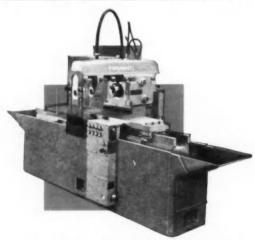
Hy Powermatics

add new versatility to automatic cycle milling



Good news for job shop and production shop managers. New CINCINNATI 100 and 200 Series HyPowermatic Milling Machines have the flexibility for both short runs and production runs. They incorporate several exclusive features, while retaining the rapid metal cutting characteristics of heavier members of the line. Hydramech table drive, for example, automatically eliminates backlash and assures smooth metal cutting for up-milling or down-milling, feeding right or left. Bed ways are square gibbed, flame hardened and automatically lubricated. Chips and cutting fluid are channeled into compartments at ends of the bed, keeping working area clean.

New CINCINNATI 100 and 200 Series HyPowermatics (7½ and 10 hp) are built in plain and duplex styles. Versatile Telematic Control is standard equipment for programming automatic milling cycles on Automatic Rise and Fall and Tracer Controlled types. New catalog M-2020-1, containing details, will be sent on request. Milling Machine Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.



New CINCINNATI 100 Series HyPowermatic Milling Machine with 36" table travel. Catalog No. M-2020-1.

CINCINNATI°

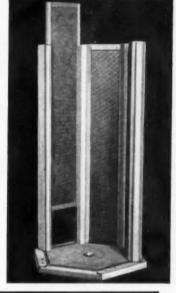
MILLING MACHINE DIVISION

KNEE TYPE AND BED TYPE MILLING MACHINES . DIE SINKING MACHINES

CUTTER AND TOOL GRINDERS
 ELECTRICAL DISCHARGE MACHINES

YOU GET <u>SIX</u> BIG BARREL BENEFITS with this new Udylok-Tempron assembly

A plating cylinder so simple in construction... you can count on its long life expectancy and repair any damage with ease.

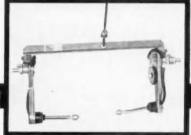




NEW INTERLOCKING CONSTRUCTION—No corrodible tie rods to rattle, work loose or get in the way...no old fashioned cemented joints. Exclusive interlocked rail and joint construction employs just 12 parts...no metal that will plate up in the entire cylinder unit.



NEW FIELD REPAIRABLE DESIGN— Standard parts are available from Udylite stocks, or you can stock spare parts and make your own repairs easily and rapidly with just a hammer and screwdriver . . . return cylinders to production in minutes.



NEW UDYBILT SUPERSTRUCTURE—Combines new principle, dependable 4 saddle positive contact with 3 point suspension . . . never any misalignment . . . no arcing . . . gears are always in mesh . . . no jumping. Can be used with old style cylinders and in your present tanks.

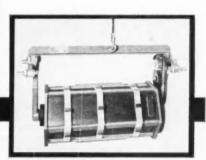


NEW UDYLON RING GEAR—New four pitch gearing provides greater-than-ever strength and durability. It's super corrosion resistant . . . will not plate up . . . inert to all solutions. New low list price, too.

NEW BELT DRIVE . . . Udylok is also available with an improved belt-drive-hanger. For additional information about either model, consult your Udylite man today or write:



NEW FIBERGLASS DOOR CLAMPS— Special epoxy-fiberglass composition . . . engineered for extra strength . . . they're flexible, lightweight, impervious to heat, cold and corrosion. NO METAL PARTS. Nearly indestructible, even under abuse.



HIGH WORK LOAD and current capacity. Easy to repair, economical in initial cost and maintenance, the Udylok assembly is loaded with buyer benefits. When you switch to Udylok in your plant you make the perfect economy move.



corporation

detroit 11, michigan

world's largest plating supplier

on the west coast the: L. H. Butcher Company



4 good reasons why you should use

IRIDITE

Chromate
Conversion Coatings

ON YOUR ZINC OR CADMIUM PRODUCTS

CORROSION PROTECTION

The wide range of Iridite coatings available gives you a choice of corrosion protection—from economical, mild protection of parts for shipment, storage or display, to extremely high protection under exposure to marine and highly humid atmospheres, gasoline or other hydrocarbons.

PAINT BASE

For an extremely tight bond for either baked or air-dried paints, non-porous Iridite blocks moisture penetration—prevents formation of metallic soap products beneath paint coatings.

APPEARANCE

Your choice of colors ranging from clear through yellow iridescent to olive drab. Bright Iridite finishes can also be dyed to provide other color effects.

SPECIAL EFFECTS

Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.

IRIDITE—a specialized line of chromate conversion coatings for nonferrous metals. Easily applied at room temperatures with short immersion times, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel. Special equipment, exhaust systems or highly trained personnel not required.

For complete information on Iridite, contact your Allied Field Engineer. He's listed in the yellow pages under "Plating Supplies." Or, write for FREE TECHNICAL DATA FILES.







Chemical and Electro chemical Processes, Anades, Rectifiers Equipment, and Supplies for Metal Finishing IRIDITE ®

Contings

4004-06 EAST MONUMENT STREET • BALTIMORE 5, MARYLAND
BRANCH PLANT: 400 MIDLAND AVENUE • DETROIT 3, MICHIGAN
Wast Coast Licensee for Process Chemicals: L. H. Butcher Co.





WAGNER Equipment



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address Letters to the Editor, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

AI ENGINEERING REPORTS

The AI Engineering Reports have been reviewed with great interest by engineering personnel of the Special Military Vehicles Office.

As you know, our engineering efforts are concentrated in research and development contracts in the field of military vehicles. Should your service publish reports on topics relating to this specialized area, we would certainly appreciate receiving copies for review. In the future, if the occasion becomes appropriate, we will refer for your consideration reports and studies prepared by our engineering personnel.

A. A. Parquette Associate Engineer Special Military Vehicles Ford Motor Company Dearborn, Mich.

· Most happy to oblige .- Ed.

I found the AI Engineering Reports of real interest. While not directly connected with the automotive industry, I found your magazine very interesting and informative. As a matter of fact, we have already purchased several of the items advertised.

Carl Kertesz Vice President Electro Machinery Div. Design Tool Corp. Brooklyn, N. Y.

R & D SUPPORT

The need is for grants from industry to carry on activities of our own choosing and we need contract research. The former would serve to fill in the gaps between projects, to start new activities, etc., while the latter would provide a live link to industry's needs and provide a direct return on industry's investment in us.

I enclose a list of our present research activities. The information on support in this list is incomplete because no dollar figures or other scale are given. In many cases the support consists in only a few hours of shop time, an item of equipment, etc., but does not take care of salaries, overhead, etc. But the list does give some idea of the scope of our activities and interest.

W. E. Meyer Professor of Mechanical Engineering Pennsylvania State University University Park, Pa.

• Inquiries for further information are invited from readers. —Ed.

BUSINESS PAPERS

The influence of the technical and business paper upon the development of America's advanced technology should be more widely appreciated. I suppose one of the greatest challenges facing the creative editorial mind is the awakening of industrial readers from the reveries of what we think we are. Breaking down the bias of superiority to which American industry has had some justifiable claim is, in my opinion, a key to the survival of our free enterprise system.

Kenneth G. Ellsworth Director of Public Relations American Standards Association New York, N. Y. For Finest Plated

finishes



Standardize 100%

on SOUTHERN

Fasteners

Here's why it pays to buy all your plated fasteners from Southern Screw. Southern makes its own fasteners from finest materials available. Our stock exceeds 1,500,000,000 pieces — all USA-made.

We have our own certified plating facilities specializing in cadmium, zinc or nickel finishes. Your order can be plated overnight if necessary. Thus your fasteners can be made and plated at one reliable source of supply. No costly, time-consuming double handling is necessary when you buy Southern plated fasteners, because Southern makes, stocks, and plates under one roof! Constant quality control is maintained through every operation.

Whether your requirements for plated fasteners are large or small, write for Southern Screw's current Stock List, requesting information about the items and finishes you need. Address South ern Screw Company, P. O. Box 1360, Statesville, North Carolina

Manufacturing & Main Stock in Statesville, North Carolina

Warehouses: New York • Chicago • Dallas • Los Angeles

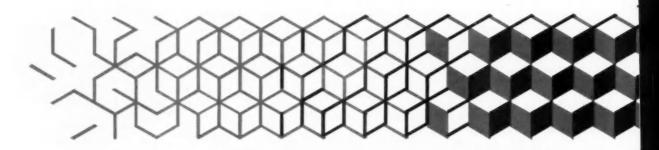
Machine Screws & Nuts • Tapping Screws • Wood Screws • Stove Bolts • Drive Screws • Carriage Bolts • Continuous Threaded Studs



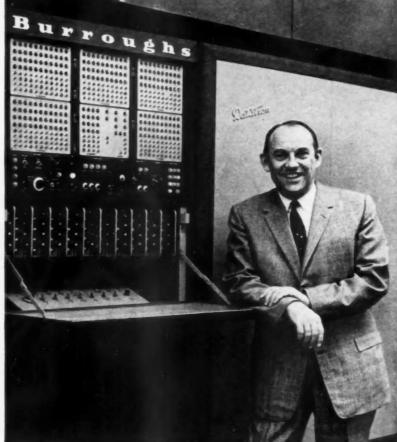
Circle 114 on Inquiry Card for more data

A statement from Behr-Manning Co.: `Our Burroughs"

$computer\ processes\ our\ customer$ $order\ data\ in\ 1/50\ the\ time"$







Behr-Manning's Philip Doherty (left) meets with members of his group at the Datafile.

Edwin C. Evans, Vice President and General Manager of Behr-Manning Co.

"Our Burroughs computer processes our customer order data in 1/50 the time... and provides our management with upto-the-minute statistical reports for the control and planning of our business."

EDWIN C. EVANS

Vice President and General Manager Behr-Manning Co.



Nearly 40,000 different products are manufactured by Behr-Manning Co., of Troy, New York, a division of Norton Company. These products have use in almost every manufacturing process... from the making of cars to the shelling of peanuts. The products are of three main types: coated abrasives, pressure sensitive tapes and floor maintenance products. Behr-Manning, with its parent company, the Norton Company, is the largest abrasives enterprise in the world, and Behr-Manning's cellophane and other pressure sensitive tapes, sold under the "Bear" Brand are quality leaders in their field.

Behr-Manning's vast selection of products are stocked and shipped from the factory warehouse and from 16 branch warehouses across the country. Their products are purchased by countless different types of customers through every major channel of distribution.

The company, which began as a sandpaper business in 1872, now has 3,000 employees. As Behr-Manning's line of products and list of customers grew, their record keeping and accounting procedures also became extremely complex. In November, 1958, they installed a Burroughs 205 electronic data processing system to solve their paperwork problems.

Behr-Manning's decision to purchase a Burroughs 205 was preceded by considerable investigation. Vice President and General Manager, Edwin C. Evans, states, "We first organized a 6-man study team. The group's job was to determine whether or not a data processing program would help us, and if so, to recommend which data processing system would help us most. When we decided to enter electronic data processing, the group prepared a detailed description of our particular requirements. We settled on Burroughs equipment because the 205 best satisfied our specific needs. Furthermore, the high capacity, low-cost random access Datafiles were especially suited to our application."

The computer soon took over a number of complex clerical functions...in actuality, 19 different computational assignments, from factory payroll to budget reporting. The computer's capacity enabled it to do all of this work in only 10 hours per week.

Despite the magnitude of these jobs, this was not the chief reason for acquiring the 205. Behr-Manning's most important need is a process called "order entry," which literally automates the entire sales-inventory-billing-report cycle.

The source of all Behr-Manning operations is the customer order, which is also a source of a mass of paper work. It must be edited, analyzed and reproduced prior to completion of processing.

"All order entry, from every branch, can be done by our 205," states Philip Doherty, Behr-Manning's Manager of Operations Analysis and Planning. "We process thousands of orders a day. An original order is picked up just once at a receiving location and all the work is done automatically in the system. An order coming in from a branch office is transmitted in minutes to headquarters by private wire, quantity and item data are automatically fed to the computer, and return wire messages make stock status and shipping information instantly available to the branch office."

In addition to processing the order, the 205's magnetic tape Datafiles, each having a capacity of 20,000,000 digits of information, hold many thousands of different customer and product records. When an order is entered in the 205, the computer locates the appropriate customer and product records, then issues

either a production order or shipping instruction. It also automatically prices the order and issues the invoice. Upon completion of a customer order, the computer automatically issues factory orders to replenish the stock level of the factory or branch warehouse.

The statistics accumulated by the 205 are then prepared in numerous different reports which are distributed either daily, weekly, monthly or quarterly in a digested form for Behr-Manning management. The reports include information on sales, finance and production. Previous to the 205 these statistical analyses required as long as three weeks to prepare. Now, even the most involved report can be issued in 48 hours, and if information is needed more quickly, it can be obtained by inquiring through the computer console. In such cases, specific replies are typed automatically by the printer.

"These up-to-the-minute reports," says Behr-Manning's President, Elmer C. Schacht, "are invaluable to us in the planning and control of our business. The information obtained from one waste report alone should save us thousands of dollars a year. In addition to improving the speed and accuracy of our own operation, installation of the 205 benefits our customers with the fastest possible service."

Behr-Manning originally leased their 205 computer, but after about nine months of use, they decided to purchase it. Vice President Edwin C. Evans points out, "By June, 1959, it was obvious that our 205 would accommodate all of our 'order entry' procedures plus many of our other data processing needs. So at that time we purchased the 205 outright. The equipment had proved itself and it made economical good sense to own it rather than rent it."

Like the people of Behr-Manning, hundreds of other industrial and business users are confirming the same experience. Burroughs complete line of electronic data processing equipment is backed by a coast-to-coast team of computer specialists, all eager to tell you how Burroughs can help in your business. For additional information, write General Manager, Data Processing Systems Group, Detroit, Michigan.

Burroughs Corporation



"NEW DIMENSIONS/in electronics and data processing systems"



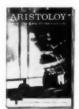
Aristoloy meets severe cold extruding requirements on track bushings for Caterpillar Tractor Company

On the backward extrusion of this track bushing a 3 x 5-inch hollow blank is extended to 8 inches in a single blow. For uninterrupted flow of production, chemical and physical uniformity of the material is essential.

On thousands of parts Aristoloy electric furnace steel has fulfilled the stern production requirements of cold extruding.

Controlled melting of selected scrap, careful rolling and precise heat treating and finishing, this is why Aristoloy is so ideally suited to high volume production where rejects caused by material faults and deficiencies can be so costly.

For complete information about Aristoloy leaded or standard carbon, alloy and stainless grades, call the Copperweld representative in your nearest large city ... or write today for NEW PRODUCTS & FACILITIES CATALOG.





COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION . 4025 Mahoning Ave., Warren, Ohio . EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

NEWS

Vol. 122, No. 7

April 1, 1960

GM Plans Smaller Autos

'61 Models to Average About 76 In. Wide

By Hugh C. Quinn, Detroit Regional Editor and C. B. Campbell, News Editor

The old comic song, "Sam You Made the Pants Too Long," was paraphrased "Detroit, You Made the Cars Too Big." A few years ago that parody was worthy of a few chuckles—or frowns.

But no more. The trend is in the other direction, and it's not just a matter of the compacts and their inroads. The old-line "standard" size cars are getting smaller.

True enough, the success of the two independents, American Motors and Studebaker - Packard, probably started the ball rolling.

Compacts Made Money

Compact cars led both of these shaky firms out of trouble and into the money. And the success of Rambler and Lark undoubtedly triggered the wave of new compacts that has not yet reached its peak.

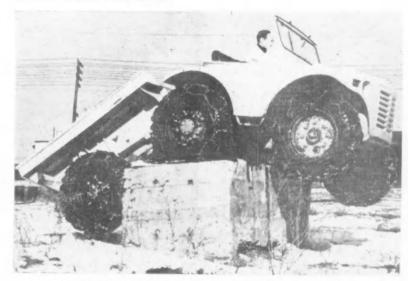
General Motors, for instance, will bring out three new compacts. It will offer a fuller Corvair line lineup with a new rear engine station wagon. Its standard cars, from Cadillac through Chevrolet, will be narrower and lighter. And GM may even trim some of the higher-priced gloss from Buick.

Oldsmobile and Pontiac. There may be some wheelbase changes, in a case or two, that will result in less overall length.

GM, of course, is not alone. Chrysler probably started the trend this year with its Dodge Dart and its limited De Soto line on a 122-in. wheelbase. For '61, Chrysler will have another compact, Lancer, built on the Valiant body, and Dodge will eliminate one of its two 122-in. models to concentrate further on the amazingly successful Dart.

At GM, the big news is the new compacts at Pontiac, Oldsmobile and Buick. All three will have the same model line-ups—four-door sedan and four-door station wagon—in two series with 112-in. wheelbase and 190-in. overall length. All three will use certain body components borrowed from Corvair.

TRUCK BENDS IN MIDDLE



Swiss-designed "Flex-Trac," a rough terrain truck, is being tested for commercial use by Clark Equipment Co. Unique construction permits raising of any of three pairs of wheels. Three-foot concrete blocks are no obstacle.

But Pontiac will emerge with a car completely distinctive, while Buick and Oldsmobile will market more of a "joint effort" product.

The small Pontiac will have a four-cylinder, in-line cast iron engine mounted at an angle, in the front. The engine, with displacement of about 194 cu in., will deliver around 125 hp. Pontiac will use a transaxle adapted from Corvair's Uni-Pak combination of engine, transmission and differential mounted over the rear axle.

In the case of Pontiac, the engine and torque converter, if needed, will be mounted forward of the toeboard so the floorboard hump usually associated with automatic transmissions will be absent. The drive tunnel will be barely noticeable, and power will feed directly to the transmission, mounted just ahead of the gear box.

Buick will build the engine for both the Buick and Olds compact—an aluminum V-8 with 215 cu in. displacement and around 130 hp. The engine will use aluminum for block, head, intake manifold, water pump, pistons—in short—an all-aluminum engine.

Single Body Program

For its big cars (bigger than the compacts, that is), GM is planning a single body program much like the 1960 body. This is a switch from the earlier plan for a return to the A-B-C body plan of former years (see AI, April I, 1959). Coat problems no doubt figure in the turnabout.

The plan for '61 calls for a common body shell for all divisions, with provisions for a three instretch in the rear passenger compartment and for variations in the wheelbase. Overall lengths of the cars, therefore, will still differ about 15 in. from the Cadillac to Chevrolet.

But the cars will be within a fraction of an inch of each other in overall width, since the bodies will share the same center post dimension. Next year, however, this will be about four in, narrower than currently. The '61 cars will average about 76 in, in width. New rooflines, with some rear quarter windows added, will

help distinguish the stretch models from the other GM cars.

Meanwhile, work is continuing on the new family of small-small cars, as reported earlier in Automotive Industries, and no one in Detroit is discounting the possibility that these four-passenger babies will be with us by the fall of 1961.

Goodyear Chemical Combats Tire Cracking

Automobile tires sold in California now contain an exclusive chemical formula, Compound 791, to combat the cracking effects of ozone, an active form of oxygen given off by exhaust gases.

When it comes in contact with an ordinary tire, ozone combines with rubber molecules and changes their structure. This causes checking and cracking of the tire's sidewalls.

The problem was acute in Los Angeles where smog frequently keeps ozone concentrations close to the ground for long periods.

Goodyear chemists came up with Compound 791 after lengthy tests at the Los Angeles plant where the tires are produced.

Diamond T Introduces Fiberglass Tilt Cabs

Diamond T Motor Truck Co. has introduced three new series of tilt cab models made of fiberglass.

The new cab is standard on the 534CG, 634CG and 734CG series which have G. V. W. ratings from 22,000 lb to 46,000 lb. All new CG models are powered by wet sleeve valve-in-head Super-Service engines.

Isbrandt Elected

Ralph H. Isbrandt, director of automotive engineering, American Motors Corp., has been elected chairman of the Engineering Advisory Committee of the Automobile Manufacturers Association.

BORGWARD GROUP INTRODUCES ARABELLA



The two-door sedan, with a flat four-cylinder engine and front wheel drive, has been introduced in New York. It has a maximum speed of 75 mph and is estimated to give 35 mpg. It has a $86\frac{5}{4}$ in. wheelbase and is $149\frac{9}{8}$ in. long. It weighs 1530 lbs. and sells for \$1750, p.o.e., New York.

CONTINUED

AMC Will Construct Plant Near Toronto

American Motors (Canada) Ltd. will build a new plant this year in suburban Toronto for assembly of Ramblers, Roy D. Chapin, Jr., president, has announced.

The plant, expected to be completed late this year, will be on a 40-acre site in Peel Village, on the southwest edge of Brampton, a Toronto suburb. Initially, the building will have a plant area of 250,000 sq ft. It will be built to allow for expansion.

Earl K. Brownridge, executive vice president and general manager said the Canadian company plans to build more than 10,000 Ramblers the first year and probably will need about 700 workers. He said production will begin after introduction of 1961 Rambler models.

AMC has sold its old assembly plant in Toronto to Elder Mines and Development Ltd., owners of the Peel Village sits. It will be the nucleus for a huge shopping center.

VW Imports Wagons, Trucks From Brazil

Volkswagen is importing VW trucks and station wagons made in Brazil to supplement lagging shipments from Germany, according to Dr. C. H. Hahn, vice president of Volkswagen of America. There is a month's wait for station wagons in this country.

Dr. Hahn says about 1200 Brazilian-made station wagons and trucks are expected in this country by the end of 1960. Shipments from the German factory should reach 36,000 this year, he added.

The Brazilian vehicles bear the same New York port-of-entry price

as the German wagons, and are basically the same. However, more than 90 per cent of the wagon's parts are built in Brazil, with about nine per cent coming from Germany.

San Jose Plant Making Only Falcons

Ford Motor Co. has converted its San Jose, Calif., assembly plant to Falcon production exclusively, adding about 2,000 units a month to Falcon output.

The Los Angeles plant will build the balance of San Jose's big Ford schedule. The move makes San Jose the fourth exclusive Falcon plant.

Churchill Predicts Prosperous Year

Harold E. Churchill, Studebaker-Packard president, predicted a "sound and profitable year for 1960 despite the scaling down of earlier optimistic forecasts."

Churchill told the national installment credit conference of the American Bankers Association that sales during the first few weeks of 1960 fell partly because of the steel strike, the new compacts and bad weather.

There is a pent-up demand for new autos, he said, and this will make 1960 a highly competitive year. "Lark," he said, "is maintaining over 9.3 per cent of the compact market."

VALIANT PRODUCTION IN DELAWARE



First Valiant leaves assembly line at Chrysler Corp.'s Newark, Del., assembly plant. Holding sign are Louis B. Kazmerowski (left), plant manager, and Gov. J. Caleb Boggs. Output for April is expected to exceed 1500.

NEWS

CONTINUED

Hupp Income, Sales Up 270 and 35 Pct.

A one-third sales increase in 1959 by the Hupp Corp. was noted in the annual report to stockholders. Sales totaled \$76.3 million for \$4.8 million income before taxes, compared with \$1.3 million income before taxes in 1958. The income before taxes was increased 270 per cent on a sales gain of 35 per cent.

Huppower Div. supplies automotive electric and manual window regulators, automotive heaters, and marine products.

In 1959, \$2.7 million was provided for contingencies and Federal income taxes, leaving a net income of \$2.1 million. After paying dividends on preferred stock, net income per common share amounted to 50 cents. The 1958 payment was 20 cents a share.

Dividends of \$2.50 a share were paid on 5% Series A preferred Chart of Hupp Corp. sales shows 35 per cent rise in 1959



stock in 1959, and a total of 4200 of these shares was retired under the plan to eliminate this senior security over a period of time. At year's end there were 109,219 shares of preferred stock outstanding.

A 5 per cent stock dividend on common stock was paid Jan. 15, 1960. At the end of 1959, 3,692,838 shares of common stock were held by 16,300 stockholders. The 1959

increase in the number of stockholders was 3400, or 26 per cent.

Seeking to further diversify its products, Hupp added five companies last year. They included American Non-Gran Bronze Co., valve operator division of Cutler-Hammer, Inc., manual valve operator business of Janes Machinery Div., Hewitt-Robbins, Inc., A. O. Sutton Corp., and John J. Fannon Products Co.

Economist Hails Business Outlook

Don't sell the family jewels yet—the nation's business is still good, despite the shift in recent weeks from optimism to pessimism. And the outlook is still favorable, according to George P. Hitchings, economic analysis manager for Ford Motor Co.

As Mr. Hitchings sees it, the gloomy talk of late has resulted from declining stock prices, cutbacks from abnormally high automobile production rates, and prospects for a slowdown in steel production. But the underlying business conditions today are just about what the experts expected when they made their 1960 forecasts three or four months ago.

In other words, the steel and automobile slowdowns were anticipated and therefore should not cause any great alarm.

Mr. Hitchings pointed out, in a recent Chicago speech, that gross national product has climbed from \$483.5 billion in the final quarter of 1959 to about \$500 billion for the first period of 1960. Part of this sharp advance was based on anticipated rebuilding of inventories.

But the inventory slowdown is being offset by expansion in business plant and equipment spending, exports, and state and local government purchases, home construction and consumer spending.

Rockwell-Standard Sets Earnings Record

Highest peacetime sales and best earnings in history were reported in 1959 by the Rockwell-Standard Corp. Net sales were \$284 million as compared with \$204.5 million in 1958. Net income of \$19.1 million was equal to \$3.61 a share. The 1958 per share income was \$1.75 on earnings of \$9.1 million.

During 1959 Rockwell-Standard acquired Kerrigan Iron Works and the Air-Maze Corp. to diversify its products. In South America, the corporation completed a new Brazilian plant. This makes Cobrasma-Rockwell Eixos S. A., a jointly owned affiliate, the largest independent automotive components manufacturer in South America. Last year, the Canadian subsidiary acquired a modern plant at Tilbury, Ont., which will be used for assembling truck and trailer axle components.

The corporation plans erection of a universal joint plant in Fairfield, Iowa, while research facilities at Birmingham, Mich., will be enlarged.

B.F.Goodrich Chemical raw materials



Line of Pendent SAFE switches with housing of Hycar are manufactured by Joy Manufacturing Company, Electrical Products Division, St. Louis, and distributed by Graybar. Switches are available in 4- and 6-button models with choice of lettered legends. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

For extra safe, improved operation

New pendent switch is encased in Hycar rubber

This new pendent switch is designed for use on hoists and other devices where suspended or portable switches are required. It is encased in a housing made from tough, resilient Hycar nitrile rubber.

Because Hycar permits such accurate molding, "O" ring seals are molded right in to make the switch watertight. Like any product made of Hycar, this housing is unusually resistant to oils, greases, acids and other corrosives. Unlike other materials tested, Hycar will not harden or stiffen at low temperatures. Pushbutton diaphragms stay flexible.

Another important advantage to the design of these switches is the resilience provided by the covering which protects the switch from damage even if it hits a hard object.

Here's another example of how Hycar nitrile rubber is improving products and opening new markets. For further information, write Dept. FL-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.



B.F.Goodrich Chemical Company a division of The B.F.Goodrich Company



GEON vinyls . HYCAR rubber and latex . GOOD-RITE chemicals and plasticizers



Now even your heavy-duty bearing surfaces can be lubricated continuously and automatically with the required high viscosity oils! An exclusive new "Thermo-Aire" feature on Alemite's Oil-Mist System preheats incoming air. This preheated air permits the atomization of the heaviest straight mineral oils.

The "Thermo-Aire" unit brings all the advantages of Alemite Oil-Mist to heavy-duty lubrication. You get automatic, continuous lubrication

1850 DIVERSEY PARKWAY, CHICAGO 14, ILLINOIS

... eliminate guesswork, cut oil consumption (up to 90%). You prevent product damage caused by oil drippings, extend bearing life, eliminate waste, save manhours, get greater safety, eliminate machine downtime and reduce the number of lubricants needed.

Write for a Free Catalog, or see your Alemite Representative



NEWS

FEATURES

\$473 Million Spent On Big 3 Plants

The Big Three spent \$473 million in 1959 on plant expansion and modernization programs—an increase of some \$52 million over the previous year but well below the average of the last decade.

Both Chrysler and General Motors showed increases in their capital expenditures while Ford reported a drop from \$89 million a year ago to \$75 million in 1959. Ford is expecting an increase during 1960, however, with several plant programs already under way.

A new Ford glass research and process development center is being established at Lincoln Park, Mich., and additional fabricating facilities are being provided at the Dearborn glass plant.

Work on titanium carbide tool bits was completed in 1959 at the Research and Engineering Center, and titanium bits are now being used. They have proved far superior to tungsten carbides in some semi-finish and finish machining operations.

Ford Motor do Brasil S. A. has substantially completed a major expansion of plant and facilities to produce trucks under a Brazilian decree which has the effect of requiring local manufacture of automotive vehicles. In 1959, the Brazilian company produced 17,-240 trucks, an increase of 60 per cent above 1958.

In Argentina, Ford was the first manufacturer to obtain government approval to make light and medium trucks. Ford plans to make sub-

RED CHINA'S FIRST PASSENGER VEHICLE



The Red Flag is claimed to be entirely of Chinese origin and is said to be in production at Changchun. Shown at the recent Leipzig Fair, the six-passenger sedan is powered by a 344.65 cu in. V-8 engine developing 220 hp at 4400 rpm. It features four-barrel carburetors and has a standard automatic transmission. Its over-all length is 226 in. while it has a wheelbase of 133.5 in.

stantial investments there in 1960 and 1961 and visualizes increased truck production.

Ford property, plant and equipment decreased by \$25 million to \$2,574 million at the end of 1959. The balance included unamortized special tool costs of \$166 million and facilities other than special tools at cost in the amount of \$2,408 million. During the year, the balance of unamortized special tool costs decreased \$34 million and gross investment in other facilities increased \$9 million.

GM upped its plant expenditures from \$269 million in 1958 to \$320 million. Largely responsible for the increase were plant conversion programs for the new Corvair, particularly at Massena and Tonawanda, N. Y. and Willow Run, Mich.

Chrysler's facilities outlay climbed from \$63 million to \$78 million, with a good share of the money going into the new St. Louis assembly plant and into plant conversions necessary for the 1960 unit body construction of all passenger cars except Imperial.

During the last 10 years, the Big Three together spent about \$7.5 billion on capital expansion, with the bulk of it paid out during the 1954-57 period. Chrysler spent nearly \$1 billion, with the heavy spending in 1955 and 1956 (see AI March 1, Page 19).

GM averaged \$440 million a year during the period, with most of it spread over a four-year period in the mid-Fifties. Ford averaged \$213 million a year, with a peak of \$815.6 million during the brisk 1956-57 period.



Imports of semifabricated aluminum products into the U. S. in 1959 increased 80 per cent over 1958. Aluminum scrap imports increased 10 per cent while imports of crude aluminum decreased six per cent. Imports of plates, sheets, bars, rods, circles and miscellaneous items amounted to 101.5 million lbs., or 82 per cent over 1958. Belgium maintained its place as principal supplier while Japan moved up from sixth in 1958 to second last year.

Truck and bus body manufacturers shipped products valued at \$305 million in 1958, a 25 per cent increase over 1954. Average employment in the industry rose 2 per cent from 1954 to 1958. Value added by industry manufacturers amounted to \$144 million in 1958, an increase of 18 per cent over 1954.

World production of natural rubber amounted to 200,000 long tons in December, 1959, compared with 195,000 tons for December, 1958. The output for 1959 was estimated at 2.065,000 tons against 1,957,500 tons in 1958. World consumption last year was 2,105,000 compared with 1,982,500 tons in 1958.

Progress in developing wire insulation that withstands temperatures to 1500F is reported in two Air Force research reports released to industry.

.

Airframe weight of civilian aircraft shipped in 1959 totaled 23,-132 thousand lbs., a 39 per cent rise over 1958. Shipments rose from 6,882 planes, valued at \$500.5 million in 1959 to 8,242 planes worth \$899.6 million last year.

U. S. imports from Western Europe reached an all-time high in 1959, while U. S. exports to that area gained only slightly over 1958. U. S. exports to 13 countries in Western Europe rose only \$45 million in 1959, while imports from those countries increased by more than \$1 billion.

Synthetic rubber now accounts for two-thirds of the total rubber used in the U. S. and its use is rapidly increasing abroad, Goodyear Tire & Rubber Co. reports. The company plans a synthetic rubber plant in Australia and is participating in a synthetic plant in Brazil. At the same time, it is replanting its rubber plantations with higher yielding trees.

Army Ordnance researchers have developed an improved preservative brake fluid for automobiles and trucks. The fluid has proved successful in storage up to 30 months and in operation at zero temperatures. It has an acceptable boiling point and causes little deterioration of rubber cups.

. . .

. . .

Why some metal parts have a shorter useful life than others is the subject of an Air Force research report released by the U.S. Department of Commerce. Metal fatigue is measured by the researchers in terms of cycles of loading and unloading.

. . .

Despite a slight increase in total U. S. exports to the area, U. S. exporters lost ground in two of their best Far Eastern markets in 1959 and competition in the area is gaining, the U.S. Department of Commerce reports. For the first time in U.S.-Japanese post-war trading, the U.S. bought more than it sold to Japan. U. S. purchases topped \$1 billion-50 per cent higher than in 1958-while U. S. sales to Japan amounted to slightly more than \$900 million. The U.S. share in the Philippines market continued its steady decline since 1949 and dropped to less than 50 per cent.

An improved process to reclaim industrial diamonds from machine wiping cloths has been developed by the Springfield (Mass.) Armory. The more economical and faster process is said to salvage five to nine per cent more of the fine diamonds, formerly wasted.

Automotive Sales Aid Wagner's Record Year

Record sales of Wagner Electric Corp. in 1959, a 31 per cent increase, are expected to be surpassed this year, G. W. Brown, president, has told the stockholders in the concern's annual statement.

Mr. Brown attributed the record sales to activity in the automotive and electrical fields and to new products developed in the last several years by Wagner researchers.

1959 sales totaled \$111.3 million, 10 per cent higher than in 1956, the previous record year. Net earnings amounted to \$6.5 million, or \$3.22 a share.

Dividends totaling \$3 a share were paid during 1959 and Wagner also distributed a 100 per cent stock dividend without reducing the \$15 per share par value.

An expansion program, under way for some time, will continue in 1960 with manufacture of fractional horsepower motors at the new plant in Brinkley, Ark.

Clevite's Profits More Than Doubled

Clevite Corp.'s total sales, profits and profit per share all set records in the 12 months ended Dec. 31.

Sales and other revenue were \$86.1 million compared with \$64.7 in 1958. Profits were \$6.4 million, equal to \$3.36 a share, as against \$3.1 million and \$1.60 a share in 1958.

Continued growth of the replacement and non-automotive bearings business is predicted by James L. Myers, board chairman.

Capital expenditures of approximately \$5 million were larger than ever before. Research development and engineering programs cost another \$5 million. This amount put Clevite in the top range of American industry in the proportion of research to sales volume.

World's Largest Broach Among Tools At GMC Truck Engine Plant in Pontiac

New types of high-precision machine tools, including the world's largest broach, are being used to manufacture GMC Truck V-6 and V-12 gasoline engines at the Pontiac, Mich., plant.

The 100-ton broach handles both V-6 and V-12 engine block castings. The V-6s have three different bores.

Another new machine grinds crankshaft fillets to such accuracy that crankshaft failure in that area is virtually a thing of the past according to Calvin J. Werner, General Motors vice president and general manager of GMC Truck & Coach Div.

In the three years spent in designing and setting up the GMC engine plant, 192 machines were brought in and integrated with 75 existing machines.

At all possible stations, quality control equipment and inspection tools, both automatic and manual, take care of in-process gaging and final inspection. Automatic installations conduct tests for hardness, leaks and check functional and dimensional tolerances.

An innovation is establishment of control stations that automatically signal when tools need regrinding. The life cycle of a tool is pre-determined, and a countdown timer is set for the proper number of operations on each tool.

The latest in automatic washing equipment removes chips, dust or grit at every point along the machine tool line, where they occur. Overhead dust collecting ducts also are a part of the system. Underground conveyors carry off chips and other waste.

Of 580 operations on the line of V-6 engines, Mr. Werner pointed

out, more than 540 also apply to parts for the V-12.

With three different bore sizes for the various engines, a variety of piston sizes is required. All are machined on the same automatically-controlled line.

The plant covers two floors and comprises an area of 619,550 sq ft.

Tractor Sales Increase Y & T 1959 Profits

Record sales and income of Yale and Towne Mfg. Co. in 1959 are expected to be equalled or surpassed this year.

The 1959 net income after taxes totaled \$5 million, an increase of 39 per cent over the 1958 income of \$3.6 which included \$1.1 million as a credit resulting from 1951-52 income taxes. Net earnings were equal to \$2.26 a share last year as compared with \$1.63 in 1958.

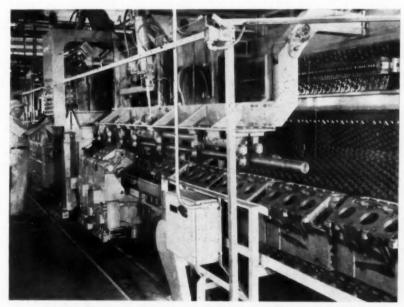
Gilbert W. Chapman, president, said the company's sales totaled \$144 million a 24 per cent increase over sales of \$115 million in 1958. Sales of earth-moving tractor shovels, materials handling equipment and lock and hardware products were the highest in the company's history.

The largest sales increase, Mr. Chapman reported, occurred in the materials handling equipment operations, including the Trojan Tractor Shovel Div.

Capital improvement expenditures last year totaled \$2,797,769 for new machine tools, patterns, jigs and dies.

Heads Hoist Makers

Herbert W. Gledhill, Jr., vice president and general sales manager, Shepard Niles Crane & Hoist Corp., has been elected president of the Hoist Manufacturers Association, Inc.



World's Largest Broach at GMC Truck Plant in Pontiac

Aluminum Engines Common in Europe; Makers Quadruple U. S. Use of Metal

Many European auto manufacturers are using aluminum engines and as much as four times more aluminum in their autos as U. S. makers.

This was the report of J. H. Dunn and James M. Smith of the Aluminum Co. of America on their recent return from an extensive European trip.

The Alcoa experts pointed out that while U. S. makers use about 56 lbs of aluminum per car, Fiat uses between 100 and 120 lbs, or four per cent of the auto's weight. Lancia uses 250 lbs of aluminum and Citroen 200 lbs.

Most European machines are low powered and engines operate at much higher speeds to deliver maximum output. Since Europeans keep their autos for a number of years, they expect to have the engines rebuilt. Consequently, replaceable cylinder liners are common.

In the U. S., engine designers shun cylinder liners because of their higher cost. This is one of the reasons for the lag in adoption of the all-aluminum engine.

Because of difficulties in development of hypereutectic aluminum alloys and uneconomic foundry procedures, there is widespread U. S. interest in development of surface coatings for cylinder bores. A finish for aluminum pistons suitable for operation in an aluminum cylinder bore also is sought.

Mr. Smith reported that light weight in trucks means nothing to European makers. In the U. S. manufacturers have made strenuous efforts to reduce truck weights by using light weight materials but have paid little attention to passenger cars in this respect.

In contrast, European manufacturers have gone all the way in aluminum in motor cars but have paid little attention to lightening the weight of their trucks.

Mr. Dunn said few European auto makers produce their own pistons. Consequently, there is widespread specialization in pistons by independents who make their own designs and do their own testing.

Many pistons are made of high silicon alloy (18-25 per cent silicon), particularly for two-cycle engines that normally run hotter than four-cycle engines. European makers agreed the high silicon alloys are more difficult to cast and machine. But, they said, there are indications the pistons' fatigue strength is improved at higher temperatures.

Use of aluminum engine bearings is widespread in Europe. Some are of the conventional 6-7 per cent tin alloys, made as castings. One company is using a leadzinc alloy and is machining bearing from extruded stock. Another favors impact extrusions. Also

used is a combination of the tinaluminum bearing alloy bonded to a high strength aluminum-copper alloy backing. Others prefer the tin-aluminum alloy bonded to a steel back.

Many European auto makers employ aluminum brake drums with cast iron inserts. One company uses disc brakes on all models that exceed 80 mph. At least one maker has standard aluminum wheels.

Corvair's Manza Expected in Month

Chevrolet is expected to begin production in about a month on the Corvair Manza, with dealer introduction slated for late May or early June.

The Manza, which was previewed at the Chicago Auto Show, is a twodoor Corvair coupe with a dressedup interior.

"BLACK BOX" TESTS BRITISH AUTOS



Electronics engineer Alan Potton adjusts telemetry transmission equipment through which readings from 23 points on new automobile are relayed to ground station. Officials of Sir W. G. Armstrong Whitworth Aircraft, Ltd., have tested strain, pressure, vibration and temperature in 10 minutes. Formerly, the conventional tests took 10 weeks.

A-C Net Increases To \$22.4 Million

Allis-Chalmers Mfg. Co. sales in 1959 totaled \$539.6 million, \$7.5 million more than the \$531.9 million sales in 1958.

Net earnings amounted to \$22.4 million, equal to \$2.47 a share and about \$3 million more than the \$19.2 million or \$2.34 a share in 1958.

The backlog of electrical and industrial apparatus amounted to \$245.2 million on Dec. 31, 1959, an increase of more than 26 per cent over the previous year's backlog.

Within the year, new plants were added at York, Pa.—hydraulic turbines and valves; Deerfield, Ill. and Wauwatosa, Wis.—tractor shovels and construction equipment; Appleton, Wis.—paper-making machinery; and Milan, Italy—crawler tractors.

A large engineering office was established in Washington, D. C., which houses 200 persons engaged in advanced nuclear power plant design.

More attention is being directed to research, development and engineering than ever before in A-C's history. At the present time, 4000 persons are engaged in one phase or another of these fields. Approximately 5 per cent of the sales income dollar is allocated to such activities. During the last five years these dollar outlays have increased more than 40 per cent.

Last October, after four years A-C showed a working prototype of a fuel cell, a device which converts the chemical energy in certain common gases directly into electricity. For demonstration purposes the fuel cell package was mounted in the chassis of a farm tractor. The 15 kw of electrical energy turned a standard A-C 20 hp D-C motor, which, in turn, drove the tractor pulling a two-bottom plow.

FIRST FLIGHT PHOTO OF ANTI-SUBMARINE PLANE



The U. S. Navy's new P3V-1, with bomb bay doors open, is seen on first flight off the California coast. Bomb bay will be fitted with suspension pylons to carry and release torpedoes, depth charges and special weapons. Developed from Lockheed's Electra, the P3V-1 has new snub-nose radome, shortened forward fuselage and carries devices to find metallic targets.

J&H Net Is \$640,000 Despite 5-Month Strike

Jack & Heintz, Inc., showed a net income of \$640,000 in 1959, or 76 cents a share. This compares with \$1.18 a share in 1958.

Sales last year were \$15.3 million despite a five-month strike. In 1958, sales were \$19.1 million and the net income was \$1,006,000.

Phillips W. Smith, president, said the company supplies the prime electric power system for the Douglas DC-8 jetliner and equipment for many other commercial airliners. The firm is expanding its motors for missiles and expects 1960 to be even more profitable than 1958.

AMC Buys Land For Employee Parking

American Motors Corp. has bought a property near its Kenosha, Wis., body plant for additional parking space for employees.

Rapid growth of employment at the AMC plant has made parking a problem. This is multiplied by the fact that shifts overlap slightly. The plant operates 24 hours a day, six days a week.

A wildcat stoppage involving 200 workers was staged last week to protest the parking situation. About 250 more parking spaces have been made available by the purchase. In addition, AMC will use a vacant building on the plot.

Triumph's Compact To Bow at N. Y. Show

Standard - Triumph Motor Co. will let the public see its new Triumph Herald small car for the first time at the International Automobile Show opening April 16 in New York. The Herald comes as a sedan, coupe or convertible, and is built on a 91.5 in. wheelbase. The sedan has a 40 hp, four-cylinder engine, while the coupe and convertible carry 50 hp ratings.

East Coast port-of-entry price will be \$1999 on the sedan and \$2149 on the coupe. The convertible price will be announced later.



RELIABLE

Whether for close-coupled main drive lines or for exposed steering and adjustment drives, designers have learned to rely on MECHANICS. Where joints must run all day at high angleswhere there are severe shock loads-where wide angles and long slip are common — and where dirt and/or moisture constantly are present—MECHANICS **Roller Bearing UNIVERSAL JOINTS** are used. Lubrication is so tightly sealed in that dirt and moisture cannot enter. Our engineers will be glad to show you how **MECHANICS Roller Bearing** UNIVERSAL JOINTS will help insure the reliable operation of your product.

MECHANICS UNIVERSAL JOINT DIVISION
Borg-Warner • 2024 Harrison Ave., Rockford, III.



MECHANICS Roller Bearing UNIVERSAL JOINTS For Tractors • Trucks and Farm Machines

Export Sales: Borg-Warner Internationa!
36 South Wabash Chicago 3, Illinois

MEN

IN THE NEWS



Ford Motor Co., Ford Div.—O.F. Yando has been appointed Southeastern sales manager.



General Motors
Corp., United Motors
Service Div.—J. Patrick
Kane has been transterred from director of
product service, AC
Spark Plug Div., to
national accounts.



Clark Equipment Co.—Robert M. Tobin has been appointed Chicago sales manager.



Hughes Aircraft Co., Ground Systems Group —Dr. Nicholas A. Begovich has been named assistant manager.



Chrysler Corp., Plymouth-De Soto-Valiant Div.—Frank J. Suslavich has been named assistant general manager.





General Motors Corp., Central Foundry Div.—Robert L. Newtson has been promoted to plant manager at Bedford, Ind.

Electric Autolite Co.—James F. Gage has been named chief engineer for ignition and controls and L. Paul Atwell has been named product manager, Spark Plug Div.

Perkin Engineering Corp.—Johan H. G. Maters has been appointed executive vice president in charge of manufacturing.

Chrysler Corp.—A. P. Podges has been named director of quality control for the Car and Truck Assembly group.

Mather Spring Co.—Donald Elliott has been named plant manager and Clinton Wohlmuth has been appointed quality control manager.

Joseph T. Ryerson & Son, Inc.— Thomas Z. Hayward has been appointed senior vice president and Weaver E. Falberg has been named vice president in charge of sales.

Goodyear Tire & Rubber Co.— Howard H. Babcock has been named news bureau manager.

DeVilbiss Co.—D. L. Bohon has been appointed manager of industrial sales.

ACF Industries, Inc.—Donald Jensen has been appointed advertising and public relations manager.

Firestone Tire & Rubber Co.—T. A. Robertson has been named manager of tire engineering and development.

Albion Malleable Iron Co.—Thomas T. Lloyd has been appointed vice president in charge of manufacturing.

All-O-Matic Mfg. Corp.—Robert A. Todd has been named vice president in charge of engineering.

Ford Motor Co.—Leo C. Beebe has been appointed public and governmental affairs manager, International Staff; John F. Mayhew, manager, public relations dept.; Joseph A. Frank, manager, governmental affairs dept. and D. E. McKellar, manager, advertising and sales promotion dept.

Gabriel Co.—John B. Hamre (left) has been named director of electronic sales and Henry J. Christ, Jr., has been appointed vice president of operations. Beech Aircraft Corp.—Edward C. Burns has been promoted to administrator for special projects; John F. Allen was named administrator of the commercial airplane division; Paul E. Allen was named chairman, research and development board and R. H. Owen was promoted to manager, manufacturing engineering division.

General Motors Corp., AC Spark Plug Div.—Ralph D. Whittier has been named works engineer and Albert E. Gasvoda has been promoted to business manager and superintendent of defense manufacturing.

Hughes Aircraft Corp.—Walter R. Klinger has been named comptroller.

Yale & Towne Mfg. Corp.—William D. Black has been named assistant to the vice president in charge of domestic and foreign materials handling operations.

Chrysler Corp.—John. E. Brennan has been appointed director of corporate manufacturing staff and services.

General Motors Corp., Allison Div.

—Harold H. Dice has been named general manager.

Allis-Chalmers Mfg. Co., Control Dept.—D. B. Scott has been named manager.

Necrology

Noel H. Miller, 55, western sales manager of Modine Mfg. Co.'s Automotive Div., died March 13. He was a member of the Society of Automotive Engineers.

Theodore E. Clark, 69, died March 2 near Springfield, O., while on his way to Florida. Mr. Clark at one time held positions with several auto manufacturers. He was chairman of Atlas Industries, Atlas Machinery Div. and Atlas Engine Works.

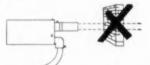
Thomas J. O'Rourke, 71, former Pierce-Arrow Motor Car Co. assistant to the president and general sales manager, died March 4 in Buffalo, N. Y.



No more hot refractory hold-ins! This new Ultra-Vision Flame Detector responds to nothing but the ultraviolet energy given off by flame and sparks. It's the *only* visual flame detector that can tell the difference between real flame and red-hot refractory or glowing carbon. At last you can be *absolutely sure* that fuel delivery will be stopped in the absence of flame.

Only this compact new control simplifies flame supervision of both single and multiple burners. The Ultra-Vision Detector, not being sensitive to a hot refractory, can be aimed at each individual flame in the most convenient way. Actually pays for itself in simplified installation and maintenance. For all gas, oil and combination gas-oil installations. Get complete details from your nearby Honeywell field engineer. Call him today. Or, write for Bulletin 95-2776, Minneapolis-Honeywell, Minneapolis 8, Minnesota.

Ultra-Vision Flame Detector sights flame of all fuels.



Not affected in any way by a hot refractory or glowing carbon.

* Trademark

Honeywell





R for Profits . . . Economic MOBILITY

An Editorial



RECENTLY, AT AN ANNUAL MEETING of a large industrial group, the subject of a major "growth industries" was discussed. Spokesmen listed a number of trade and industrial fields as those which comprised the major "growth" fields. Their omission of the automotive field was not surprising.

IT TOOK A GREAT DEAL OF PERSUASION to bring the thinking of the group around to accept some of the basic facts about the automotive field. The first simple fact accepted was the proposition that everything that is made has to be moved from the maker to the consumer.

MORE AUTOMOBILES AND TRUCKS ARE USED in such "mobility" functions every year. Growth pattern of trucks, tractors, and trailer-truck combos certainly supports the status of these kinds of automotive products as being in economic "growth" areas. Moreover, more people go farther every year to reach places, and they go principally by automobiles. This steady increase in their radius of action certainly qualifies the passenger car field as a "growth" industry, because people have to get to the places to which they are going. These days they can not get to many towns, villages and cities by any combination of railroads, subways, elevated lines and/or ships. The vehicle passenger miles per capita by automobile are growing steadily, qualifying the passenger car industry as a major "growth" industry.

IN EACH OF THE OTHER "EIGHT CYLINDERS" of the automotive industry there are comparable "growth" facts. Marine engines and industrial engines are in a spectacular long range trend of increased use. The entire U. S. Army has to be equipped with new and modern vehicles to provide adequate military "mobility" of the variety now sought by the Chiefs of Staff. While the Army "mobility" vehicular program now seems to have a much larger "gap" between plan and fulfillment than the missile program, eventually the Pentagon may get around to ordering the vehicles which will have to be ordered to prevent inadequate preparedness for meeting the challenges of limited wars.

OFF-HIGHWAY VEHICLES, farm equipment and construction equipment also share in this total "growth" appearance of the automotive field. Facts and detailed data concerning these and other areas are available to any interested persons. The "compact" car clan seems to have run far ahead of 1959 original expectations, with even larger "growth" looming strongly ahead.

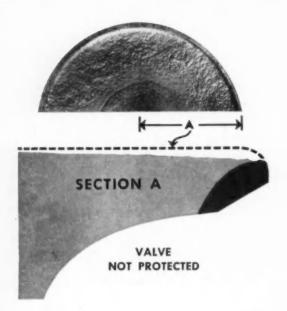
AUTOMOTIVE ANALYSTS OFTEN WONDER how such facts lag in reaching the public. On even the military vehicle situation, for example, it was only later in 1959 that American readers learned graphic details about the new emerging class of vehicles often described as "hovercraft." But last May 7, 1959, the Royal Military Academy, Sandhurst, Camberley, England, was told by Lt. Gen. Arthur G. Trudeau, Chief of Research and Development, Department of the Army (U. S. A.), that "although the day of the horse cavalry is long past, we find that the combat trooper may again embrace the wonderful esprit and dash of those old horse units. This time he will be a member of the 'sky cavalry' and dart around the battlefield on a true flying platform that hugs the 'nap' of the earth while traveling at normal highway speeds."

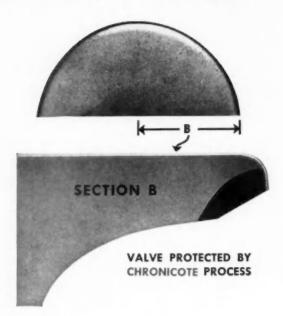
Lt. Gen. Trudeau Did Much More than merely lecture to the British military students. He pin-pointed a fact that all of us here in the United States ought to study more seriously. He pointed out that advances in "mobility" are inevitable, because both peacetime and military economy demand them. This mobility which is most closely bound to automotive vehicles is the largest single growth requirement of the public as well as the military organization, because no other industry can move so many increased numbers of people as rapidly, as far and as economically as they have to move. Let's talk up mobility more. It tells what modern automotive vehicles provide.

Hortey W Barelay
Editor and Publisher

CHRONICŌTE

A New Low-Cost Corrosion-Resistant Valve Head Coating that Eliminates Deposit-induced Preignition





CHRONICOTE is a newly developed Eaton process of applying a chrome-nickel alloy to heavy-duty valve heads. At reasonable cost, it provides a degree of protection against preignition and corrosion heretofore accomplished only by means of much more costly methods.

We will be glad to furnish your engineers with technical reports covering life comparisons between CHRONICOTE and unprotected valves. We believe you will agree that Eaton CHRONICOTE Valves provide the long-sought solution to the problems of rapid corrosion and deposit-induced preignition. Write, wire or phone.



CHRÓNICÓTE

Means Extra Thousands
of Trouble-Free Miles!

EATON

MANUFACTURING COMPANY
BATTLE CREEK, MICHIGAN

PRODUCTS: Engine Valves • Tappets • Hydraulic Valve Lifters • Valve Seat Inserts • Gears • Hydraulic Pumps
Truck and Trailer Axles • Truck Transmissions • Permanent Mold Iron Castings • Automotive Heaters and Air Conditioners
Fastening Devices • Cold Drawn Steel • Stampings • Forgings • Leaf and Coil Springs • Dynamatic Drives and Brakes
Powdered Metal Parts • Variable Speed Drives • Speed Reducers • Differentials • Centralized Lubrication Systems



Daily quality audit reports on assembly operations in 38 zones.

Chrysler Imperial Quality at Work

By G. T. "Tom" Poirier

PLANT MANAGER

THE Quality Control program at Imperial is a highly integrated program aimed directly at quality improvement, not only for the model presently being produced but for future models to come as well. We believe very strongly that the corner stone of a sound quality control program is concentration on defect elimination or prevention before they happen rather than the sorting of good from bad products after the fact.

The quality control efforts are guided by a constant "feed-back" of information from many sources. These sources include in-process audits throughout the manufacturing system, many different types of quality audits conducted daily by Central Manufacturing Staff personnel, and a report of warranty and customer complaint information from the field. From this information quality problems are pin-pointed, the necessary cause and effect relationships established, and an effort made to control or

IMPERIAL **PLANT HIGHLIGHTS**

LOCATION

8505 West Warren at Lonyo, Dearborn, Mich.

PRODUCT

Imperial, Imperial Crown, and Imperial LeBaron automobiles

PERSONNEL

QUALITY CONTROL

INSPECTION STATIONS

FLOOR AREA

More than I million sq ft on one floor

TOTAL LENGTH CONVEYOR SYSTEMS

20,780 ft or nearly four miles

PAINT OVENS

Six ovens totaling 1928 ft

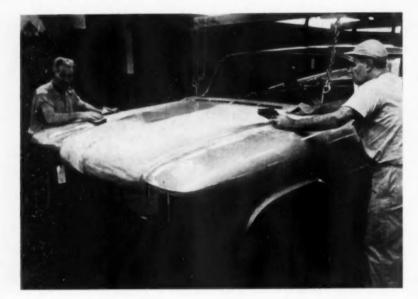
PAINT PRESSURE

58,320 ft or more than 11 miles

CAPACITY PRODUCTION RATE

27 units per hr





eliminate the cause. In cases where inherent design conditions are involved, information is fed back to Engineering for corrective action on the present model, avoiding these conditions on future models.

In addition, a comprehensive new model part sampling program is maintained in conjunction with new model pilot car activities. This program is intended to verify that tools and fixtures at both Chrysler and outside supplier plants are capable of producing parts and sub-assemblies to specifications prior to the start of new model production.

All of these are never ending day-to-day quality control activities with problems and conditions changing as each model completes its cycle.

FUTURE PLANS

Future plans for the Imperial Quality Control program call for a better organization and definition of all functions related to quality control. More emphasis is to be placed on the data analysis and problem solving activities. The collection, analysis and dissemination of information is to be mechanized where possible in order to get more facts into the hands of the proper people more rapidly for prompt corrective action. For example, a system of tabulating, re-

LEFT-

Shown at one of the 38 Imperial quality control zone inspection stations, an Imperial body gets a thorough paint finish inspection by quality specialists. An average of four gallons of primer, sealer and finish paint are applied to each Imperial.

LEFT. BELOW-

Certain Imperial bodies receive special hand care in the form of dry sanding prior to application of additional finish paint. Each Imperial spends an average of eight hours in the paint department.

NEW WELDING PROCESS (MIG)

for Critical Areas

NEW welding system called MIG, (initials for metal, innert, gas) has recently been added to facilitate quality handling of critical welding areas in the body-in-white section of the Imperial plant. Not intended to supplant the present resistance welding methods now in use, the new MIG system is used to weld body areas otherwise inaccessible to bulky resistance welding equipment.

The MIG welding gun is literally shaped like a large pistol complete with trigger. A thin metal wire is fed through the top of the pistol grip into the center of the barrel. Direct current is fed to the barrel via connections in the base of the pistol grip.

To weld a metal seam, the welder simply presses the tip of the pistol barrel to the area to be welded. He pulls the trigger. A shower of sparks, and the result is a neat round weld the size of a pencil eraser.

Imperial quality inspectors report excellent consistency of quality with the MIG system.

cording and reporting each suppliers quality performance as each shipment is received, is now being installed. An active program is underway for the development and purchase of high speed I.B.M. electrical analyzing equipment in order to do a more thorough job of controlling the quality or electrical components both as received and in process.

Water sanding of all Imperial bodies is done two complete times. Sanding assures satin-smooth finish by preparing body for succeeding coats of finish paint. Smooth surface holds paint more readily.

Final inspection OK is checked in detail before cars are transferred into the delivery floor area.

It is also planned in the future to intensify our efforts in the area of educational programs. These courses range from "problem-centered" instruction for production supervisors and operators to blue print reading for receiving inspectors.

Many Quality Control procedures and programs started at the Imperial plant have been installed at other Chrysler Corporation Assembly plants. Among these are: an effective system for controlling body-in-white and body welding quality; a system which utilizes portable torque calibration stands to assure each wrench is performing properly throughout the plant: a system of quality complaint investigation reports for the purpose of defining quality problems, placing responsibility and follow up for correction, and the I.B.M. system for supplier performance as mentioned above.

The Imperial Quality Control program has as one of its major goals, the delivery into the hands of Imperial dealers and owners, cars of a higher quality level than have ever been attained by the industry to date. This should increase the intrinsic value of the Imperial in the eyes of the owner, and increase his pride and pleasure of ownership.

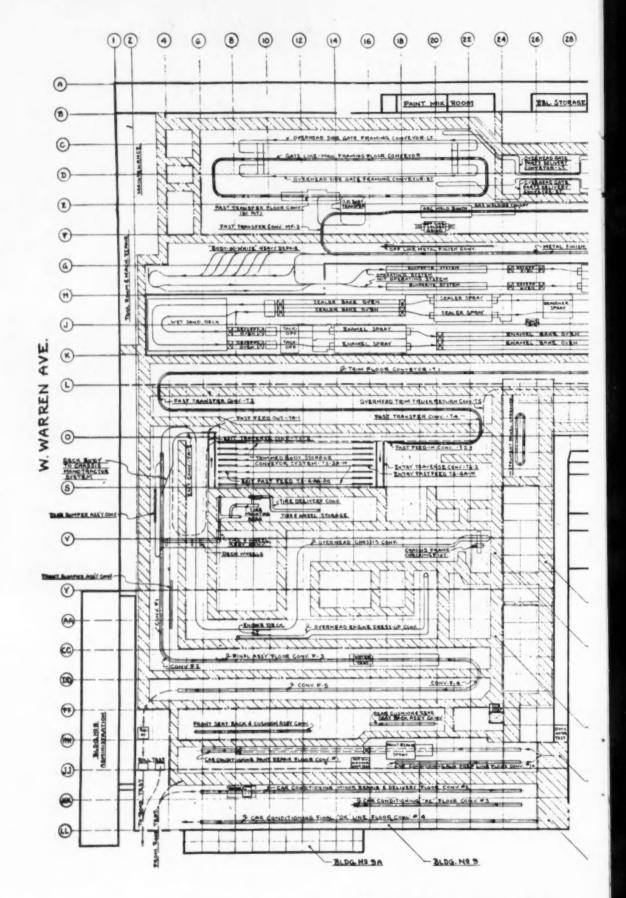


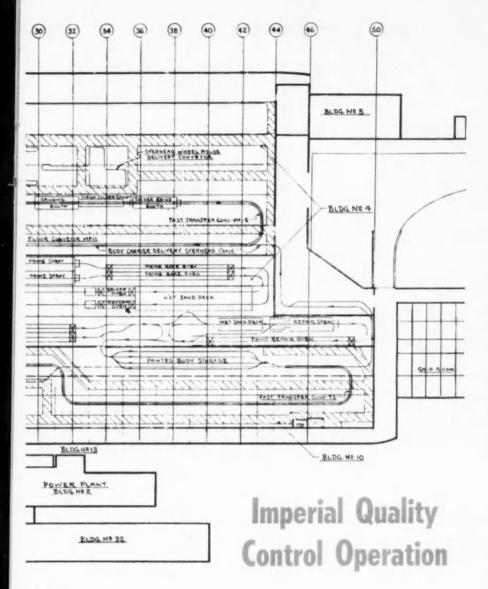


PROCESS DESCRIPTION

Quality "auditors" move into the Imperial plant without advance notice. They pick Imperials at random from the assembly line for basic quality audits which involve the checking of hundreds of items. Introduced in late 1958, the audit system has shown a continued quality up-trend which has continued in the checking of 1960 assemblies. The four basic categories of quality checked include: body-in-white metal, a water-seal test, a visual body finish check and a functional 30-minute road test. The audits supplement a continuously operated quality control system which is based upon operation of a 38-zone control checking operation. Nearly 100 quality control specialists are required for staffing these repetitive activities. Many of these experts have been trained in company-paid training sessions.

Briefly, here's how the fully developed four-point quality control system works: Fact gatherers on the production line continuously gather information pertaining to quality of product. These facts are fed to a control group of analytical engineers, who analyze and chart over-all quality trends. The analytical engineers interpret quality trend figures and "feed back" corrective-action recommendations to





BLDG.NR3

BLDG. Nº 1

Quality control station locations may be identified on the accompanying floor plan by cross-checking the numerical and letter location codes listed for each quality check

BLDG. Nº 14

QUALITY CONTROL STATIONS

INSPECTION LAYOUTE6
Precision dimensional checks to engineering drawings performed on parts BLDG. Nº 18

BODY-IN-WHITE RECEIVING INSPECTION F44
Inspection of all incoming shipments of stampings

BLDG. Nº 9C

SUB-ASSEMBLY WELDING ing quality

CRITICAL AREA WELD INSPEC-TION E-15-16 Final spot welding inspection of the complete body shell for quality of welds in critical areas

MASTER BODY CHECKING
FIXTURED-6
Check on locations of all important
body assembly points on a sample of bodies daily.

METAL FINISH INSPECTION...F-28 Inspection of all metal surfaces for finish flaws and satisfactory fits WINDSHIELD & BACKLITE

OPENING INSPECTIONE-16
Plug gage inspection to determine
whether openings will satisfactorily
occept the glass, and of drilled
molding holes for O/S moldings

SAMPLE TORQUE INSPECTION F-20 Of all body fasteners for tightness

FINAL O.K.F-14
Of completed body prior to painting

IN-PROCESS PAINT & SEALING.H-10 Inspect quality of all sealing opera-tions and surface preparation of body prior to final paint application

PAINT REPAIR INSPECTION.....J-36 Inspect refinishing operations on bodies not up to Imperial standards through normal processing proced-ures. Inspection of all two-tone bodies for second color quality

TRIM MATERIAL CUT & SEW INSPECTION on second floor. HH-14 Inspects cutting operations on leath-er and cloth. Inspects all sewing operations

INSTRUMENT PANEL INSPEC-

TION 0-24 For completeness, electrical and me-chanical performance, and appear-ance prior to assembly into the body

TRIM LINE STATIONL44
Inspects for completeness of trim installations made from Paint to the
end of the first production foreman's group

TRIM LINE STATION #2......L-36 Inspects for completeness of all trim installations made by production group #2 and for repairs made on items written at station #19

INIM LINE STATION #3.....L-28
Inspects for completeness of trim installations made by production group #3 and performs first electrical check of bodies. Checks off repairs written at station #20

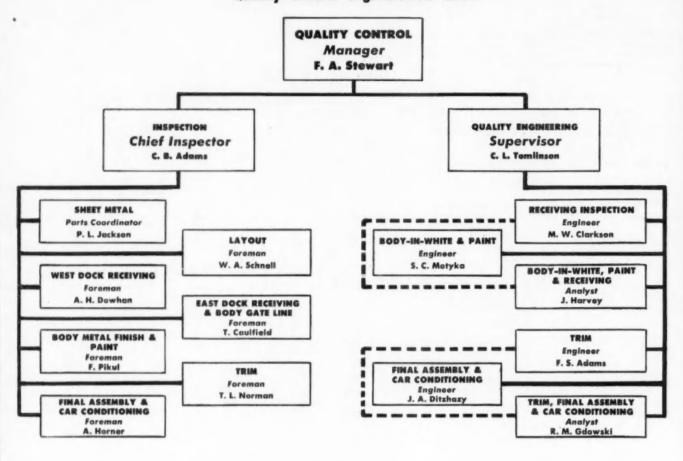
TRIM LINE STATION #4.....L4 Inspects for completeness of all trim installations made by production group #4 and for proper repairs made on items written at station #21

TRIM LINE STATION #5.....L-12 Inspects for completeness of all trim installations made on bodies by pro-duction group #5 and for proper repairs made on items written at station #22

TRIM LINE STATION #6.....L-18
Inspects for completeness of all irim
installations made on bodies by production group #6 and final electrical
check. Checks off repairs written at
station #23

IN-PROCESS INSPECTION.CC-14 & 16 Inspects all operations performed af ter body drop to assure completeness and tightness of all cars for 100% in-line water test (Turn to page 78 please)

Quality Control Organization Chart



pin-pointed production or pre-production areas. One hundred per cent station inspection is the detection and immediate correction of quality defects as they occur on the assembly line. The "feed back" of information is in the form of daily quality control charts sent to line foremen. In addition, hourly quality control tabulations are maintained for greater quality accuracy.

CHECKING DEVICES

To help the quality control task-force carry out their important assignments, an array of quality control checking devices are located along the assembly line. The devices include:

- 1. An "R-1" master body checking fixture-this device is designed to spot check bodies as to accuracy of dimension and to indicate to quality men if dimensional adjustments are needed.
- 2. Checking "plug" or template-these are different sized templates made to the exact dimensions of windshield, back window, and door openings. The "plugs" are fitted into these body-shell openings during the preassembly process to determine accuracy of dimension.

3. Static water-test booth-located near the final assembly line, this booth will be used to spot check the efficiency of the water-test booth which is located on the final line.

(Turn to page 78, please)

IMPERIAL PLANT DATA

KEY EXECUTIVES

- G. T. Poirer, Imperial Plant Manager
 C. V. Miller, Director of Personnel
 F. C. Martin, Plant Comptroller
 F. A. Stewart, Manager-Quality Control
 W. B. Shimer, Chief Industrial Engineer
 L. H. Bell, Manager-Production Control
 H. E. Smith, Resident Engineer
 R. E. Hewlett, Manufacturing Engineer
 C. R. Lautz, Production Manager

PRODUCTION INNOVATIONS

- 100 per cent individual road test of each car.
- 100 per cent individual water test of each car on assem-
- bly line. First automatic static body switching system.
- New air conditioning charging and testing conveyor.
- High speed 180 degree conveyor turn.

WELDING.

Primary Production Method For Motor Vehicles





Flash butt welding machine for wheel rims

Seam, projection, flash, upset, and percussion welding are described in this installment of a five-part article.

The final part will appear in an early issue of AUTOMOTIVE INDUSTRIES

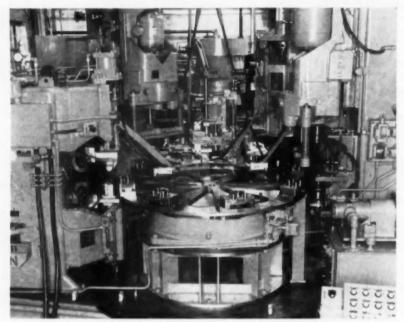
Andrew W. Shearer SEAM WELDING

Seam welding is a resistance welding process in which coalescence is produced by heat obtained from resistance to the flow of electric current through the workpieces held together under pressure by circular electrodes. The resulting weld is a series of overlapping spot welds made progressively along a joint by rotating the electrodes. When roll-spot welding (see "Spot Welding" section) is used, the weld nuggets do not overlap.

The seam welding process has a great deal in common with spot welding. Welds may be single or multiple, *i.e.*, a single seam or two or more parallel seams produced simultaneously. Welds may be direct or indirect, as in spot welding. Seam welding may be performed in several ways, depending on travel speed and timing of welding current application.

There are a number of different types of seam welds. Perhaps the most commonly used type is the simple lap seam weld. Here the pieces or edges of metal to be welded are lapped enough to prevent splitting of the weld metal from the edges of the stock. The flange joint, a design often used on automotive gasoline tanks, is another example of a lap joint.

Mash welding is another and widely used form of seam welding. The



This dial feed welding machine combines resistance welding, hopper feeding, pressing, and precision machining in one unit. It consists of a hydraulically operated eight-station dial, as shown, for making automobile brake backing plates. (National Electric Welding Machines Co.).

circular electrodes "mash" or flatten the plastic weld metal while the current flows and high electrode pressure is exerted. Since the overlap is considerably less than for the lap joint, sheet 1/16-in. thick is about the heaviest stock mash seam welded with good success.

While low-carbon steel is the most satisfactory metal for mash seam welding, the process has been used on stainless steel for certain applications. Due to their limited plastic range, non-ferrous metals cannot be mash welded successfully.

The foil-butt seam weld is a new and patented process in which the edges of the sheets to be joined are butted together. A thin and narrow strip of foil is introduced above and below the butt joint line as it is passed between roller electrodes. The foil serves as a bridge to distribute the welding current evenly between the two sheets and to prevent an overly rapid withdrawal of heat from the work.

The foil strip provides added electrical resistance and aids in containing the molten weld nugget while it expands and cools. The sheets to be joined are usually clamped together. In some cases, the foil is roll-spot tack welded at lower heat before it is seam welded. The resulting joint is a smooth and non-overlapping seam of high strength and neat appearance.

Still another type of seam weld-

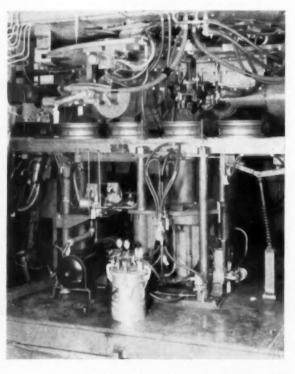
ing is the butt seam weld, frequently used in the manufacture of electric welded piping and tubing. A variation of this process is sometimes used on automobile horns and other low-strength joints.

Seam welding is most suitable for large sheets, tubing, and similar items manufactured in sizable volume that are particularly adaptable to automatic feed. It is also an excellent method for fabricating high-production small parts requiring a continuous seam. Some of its major automotive uses are for welding fuel tank assemblies, roof panels to drip rails, wheel housing assemblies, shock absorber case assemblies, vacuum tanks, propeller shafts, and engine front covers.

Equipment

Seam welding machines (also used for roll spot welding) are similar in construction to spot welding machines. The electrodes, however, are disks (wheels) which are rotated by a driving mechanism. Knurl or friction roll, gear or shaft, and "traveling roll" drives may be used.

One operator loading this fully automatic automobile welder can maintain cycling rate about 800 per hour (depending on material gagel. The machine not only welds the rim and disk together, but also assembles the wheel. pierces and chamfers the valve stem hole. and embosses the lugs for attaching the hub caps (Sciaky Bros., Inc.1.



The basic components of a standard seam machine are: 1) main frame which contains the welding transformer and tap switch; 2) welding head with means of pressure application—almost always a direct-acting air cylinder—and head slide mechanism; 3) welding wheels, bearings, and secondary connections to the transformer; and 4) means for driving the electrodes or the work and adjusting their speed.

There are four general types of seam welding machines:

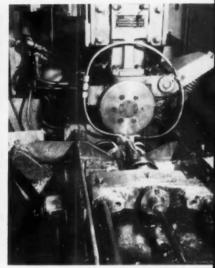
- 1) Circular (transverse) in which the plane of the electrode wheels is at 90 deg to the throat of the machine; the work travels perpendicular to the throat.
- 2) Longitudinal, in which the plane of the electrode wheels runs parallel to the throat of the machine. The work travels into or out of the throat, and the length of the seam is limited by the throat depth.
- 3) Universal, in which the electrode wheels may be set in either a circular or longitudinal position. This is achieved by use of a swivel-type upper head so that the wheel and its bearings can be turned through 90 deg. The lower wheel mounting may consist of two interchangeable lower arms, or both may be attached permanently to the machine by hinges or a swinging column; thus, either one may be swung into place.
- 4) Platen, with moving platen or electrode.

In addition to the above, many types of machines have been developed for special purposes. Portable seam welding machines may be used where the work is too bulky to be handled through regular electrodes. The welding of drip rails on automobile bodies and the fabrication of disposable fuel tanks for aircraft are good examples.

One of the major problems in seam welding is the proper cooling of the machine and the work to prevent excessive warpage. Flood cooling is probably the most effective way of overcoming this difficulty. The most common practice, however, is the use of jets



After leaving body framing line at Imperial assembly plant, bodies have roof panels seam welded to roof rail sides. Welding of three metal thicknesses should be avoided in this type of operation (Chrysler Corp.).

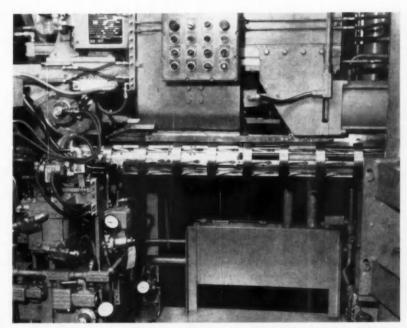


Resistance seam welding machine for attaching end cap to tube for shock absorber body (Ford Motor Co.).

of cooling water before and after the wheels on both sides.

PROJECTION WELDING

Projection welding is actually a modification of spot welding. The parts to be welded are designed so that the welds are localized at predetermined points by projections, embossments, or intersections. These direct the flow of the welding current from one workpiece to another. The larger and higher-quality electrodes used have a longer production life than those employed for spot welding.



Stator rings for the torque converter in the Buick twin-turbine transmission are formed from coil stock on this set-up. The steel is cut to length, rolled into a circle, and then seam mash-welded (Buick Motor Div., General Motors Corp.).

The process is particularly effective where several welds are to be made in a small area. It is most often used to attach fasteners, or to join metal parts with natural projections (as in cross-wire welding). Many punched, stamped, formed, and screw machine parts lend themselves well to projection welding.

Three basic projections most commonly used are the button, cone, and spherical types. The first is employed for welding flat sheets of 24 to 13 gage thickness. The cone type is used for sheets ranging from 12 to 5 gage in thickness. Spherical projections are applicable to the welding of heavy sections, forgings, etc. Other types of projections are used for special purposes in the welding of certain parts. A familiar one is the ring projection for joining rods, tubes, and similar parts.

Projection welding is not suit-

able for all metals. First, the metal must be strong enough to support the projection. Copper and some brasses, for example, are too soft. In addition, copper has a high degree of electrical conductivity. Aluminum has been welded to a limited extent; best results have been obtained with extruded parts. Coated stock and some dissimilar metals are being projection welded successfully.

The projection welding process is growing steadily in importance as an automotive fabricating method. Bumper bracket assemblies, rear axle housings, torque tubes, brake pedal sub-assemblies, instrument panel extensions, steering column assemblies, and miscellaneous fasteners are but a few of its many areas of application.

Equipment for Prolection Welding (See Spot Welding Section)

FLASH WELDING

Flash welding is a resistance welding process wherein coalescence is produced, simultaneously over the whole area of abutting surfaces, by the heat obtained from resistance to the flow of electric current between the two surfaces, and by the application of pressure after heating is substantially completed. Flashing and upsetting are accompanied by expulsion of metal from the joint.

Flash welding is done by placing two work parts in the jaws of the machine. As the parts are brought together into very light contact, a voltage of sufficient strength to form a flashing action between the parts is applied. Flashing continues as the parts advance until the work pieces reach a forging temperature. The weld is completed by the application of sufficient forging pressure and the interruption of current. Additional steps, such as preheating, are required in a number of applications.

In recent years, shielding atmospheres such as city gas, hydrogen, and the inert gases have been used to improve the quality of the weld joint by reducing the probability of oxidation of the flashing edges. Production runs of flash-welded assemblies have been achieved with the aid of a shielding gas.

Provided the parts are properly designed for its use, flash welding is a quite satisfactory joining process. It can usually be applied to almost any combination of metals, no matter how dissimilar. Closer tolerances can be obtained with flash welding than with any other welding process consistently.

Since it is a quick method for joining tubes, bars, wires, sheets, and light sections, flash welding is widely used in fabricating automotive products. Applications include starter ring gears, transmission parts, seat frames, torque tubes, body parts and trim, wheel rims, and steering shafts.

Equipment

Basically alike in structure, flash and upset welding machines may be manual, semi-automatic, or automatic in their operation. The two types of machines differ primarily in the devices employed for producing motion during the welding operation. These machines consist of the following basic ele-

ments: 1) a main frame, including transformer and regulator; 2) a set of clamps to hold the workpiece and a circuit to supply the welding current; and 3) a mechanical means to force the work pieces together.

Flash and upset welding machines usually operate in a horizontal position. A stationary platen is secured to the frame at one end, while a movable platen is mounted on suitable ways and connected to the upset mechanism at the other end of the frame. The platens, generally made of cast iron or steel, are designed to accommodate copper terminals, which are connected to the transformer (located inside the frame). They are also designed for mounting of the welding dies.

The upsetting force is applied as near as possible to the line of work, both vertically and horizontally. Purpose is to prevent unnecessary forces from being transmitted through the movable platen ways. The upsetting mechanism can be manually, pneumatically or hydraulically operated, or motordriven.

UPSET WELDING

Upset welding is the earliest form of resistance welding. Coalescence is produced simultaneously over the entire area of abutting surfaces or progressively along a joint by the heat obtained from resistance to the flow of electric current through the area of contact of those surfaces. Force is applied before heating begins and is maintained throughout the heating period.

The process differs from flash welding in that no flashing occurs at any time; the heat is developed solely by the resistance between the two parts. Best results are usually obtained when the parts to be welded are equal in cross-sectional area and resistance.

Upset welding is used for applications ranging from the welding of small ferrous and nonferrous strips and wire to the welding of longitudinal butt joints in tubing and pipe and transverse butt joints in heavy steel rings. Its

automotive uses are fairly confined to the welding of such small parts as rods, tool salvage work, and plant maintenance operations.

Equipment for Upset Welding

(See Flash Welding Section)

PERCUSSION WELDING

Percussion welding is a resistance welding process in which coalescence is produced, simultaneously over the entire area of abutting surfaces, by the heat obtained from an arc produced by a rapid discharge of stored electrical energy. Pressure is applied percussively either during or immediately subsequent to the electrical discharge.

Applications of the process vary according to the type of power supply used, method of initiating the arc, and means for producing the welding force. One advantage of percussion welding lies in the fact that heat-treated metals can be welded without annealing or otherwise impairing the heat treatment; total depth of the heat-affected zone is only about 0.010 in

However, all percussive processes are limited to butt-welded joints. Second, since control of the path of any arc is difficult, the total area that can be joined with best results at any one time is lim-

ited to ½ sq in. or less; even then, it should be fairly concentrated. On larger sections, the arc often fails to distribute itself uniformly over the entire area, and cold or unwelded spots occur in parts of the joint.

The percussion welding process is generally suitable for joining pieces of rod, tube, or pipe to each other or to flat surfaces. This may often be accomplished more economically, though, by flash welding. Therefore, percussion welding for such applications is usually confined either to joining pieces of totally dissimilar metals not weldable by the flash method or to parts where complete lack of flash is imperative.

Another important limitation of percussion welding is that the parts to be joined must be separate. It is not possible to form a ring or a band by joining the two ends together. Major use of the process in the automotive field is for welding studs to trim.

Equipment

Percussion welding machines are stored-energy type units and are not considered in the same category as other types of resistance welding equipment. Principles of operation are, for example, entirely different from those used for spot welding. A percussion welder is basically an upset welding machine, and only work of this kind can be performed with it.

Power is taken from a threephase, a-c line and is transformed and rectified to a high voltage (about 3000 volts d-c). This voltage is then used to charge a bank of capacitors. The capacitor terminals are connected directly to two sets of electrodes which clamp the work to be welded. The workpieces are separated and insulated from one another enough to withstand the high voltage to which they are subjected.

By means of a spring or other suitable device, one of the work-pieces travels toward the other at a high rate of speed. When they reach arcing distance (determined by the voltage to which the capacitors are charged), the capacitors discharge themselves through the gap; an intense heat on the surfaces being welded is thereby created.

When the two pieces of metal actually come in contact, the discharge is completed, and they are forged together.

Another method of percussion welding uses a low-voltage, stored-energy (electrostatic or electromagnetic) discharge. The work-pieces are brought into contact and separated to establish the discharge arc and then forced together with an impact.

RESISTANCE WELDING TRENDS

The automotive industry is the major industrial user of resistance welding from the standpoints of sheer quantity, investment, and physical number of welding units. A calculated guess would be that at least 50 per cent of the total number of resistance welding units sold annually go into this market. It is estimated that the dollar volume of resistance welding should reach \$180 million in 1965, compared to \$80 million in 1957.

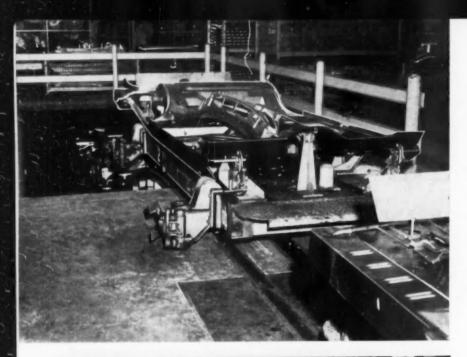
Resistance welding is often preferred wherever practicable in automotive fabrication for a number of reasons. Among these are its good inherent strength in high-speed operation and its low operating costs, since no additional materials are required. The latter factor gives it a decided edge over the other welding processes in finished part cost. Therefore, there is a marked trend in the field to design for resistance welding whenever feasible.

Applications for various forms of the process in automotive manufacturing operations are already legion and will continue to grow. To take a single case in point, most of the some 5200 welds that go into the Chrysler Valiant body (a "small" car at that) are resistance types. On a pure volume basis, resistance welding cannot help but skyrocket in numbers of applications because of the swing toward unitized bodies alone.

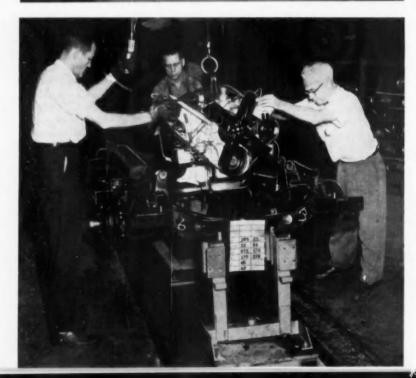
Current and future trends in resistance welding all point to automation, including packaged production lines and automatic handling of work. Looming on the horizon are more automatic lines combining such operations as blanking, forming, drawing, welding, machining, drilling, assembling on a common base. Of course, there will always be some single purpose or standard machines used.

Automotive engineers continue to stress higher production rates at lower costs. This requirement is bound to bring about more applications of feedback control to

(Turn to page 86, please)







Latest PRODUCTION METHODS

at

Plymouth Assembly Plant

Ror two years the Plymouth assembly plant was in the throes of a radical expansion and modernization program carried out without interrupting either 1958 or 1959 car production. The objective here is to highlight some noteworthy features of the current setup with emphasis on unique transfer or transition points in various parts of the plant.

In effecting the changeover plant management was confronted with many unusual problems concerned with the packaging of a comprehensive paint shop, body fabrication facilities, and final assembly

TOP-

Start of body framing line at Plymouth. Fixtures are coming up to floor level fitted with the underbody and certain loose parts, ready to meet the gate line.

MIDDLE-

This is the beginning of chassis assembly. Here the stub frame is being fitted with front suspension parts while riding on the overhead conveyor.

BOTTOM-

Stub frame and rear axle riding the fixtures on the chassis conveyor. At the point seen here the powerplant is being lowered onto the stub frame.

By Joseph Geschelin

DETROIT EDITOR

lines in a relatively long and narrow building. In the process they dismantled 146 overhead conveyors, replaced them with a system of 127 conveyors located in entirely new positions.

Even so, it was necessary to install six big drying ovens on the roof of the building, occupying a space of some 56,000 sq ft. In fact, the paint shop area is so crowded that it is not feasible to take photographs of operations or equipment. We can only note that among the new items of equipment in this area are two of the latest installations of Ransburg No. 2 electrostatic automatic paint spraying systems. One of these is found in a large booth for spraying the prime coat on complete bodies; the other, a smaller unit, is being tried out for color coating of small stampings such as moldings.

Both paint shop and body fabrication areas are located at one end of the plant. Body fabrication begins with the scheduling of stampings in sets on the feeder conveyor serving the start of the gate welding line. Sub-assemblies for this purpose are welded together on fixtures adjacent to the feeder line. The sets of parts then are transferred to the gate fixtures and

-TOP

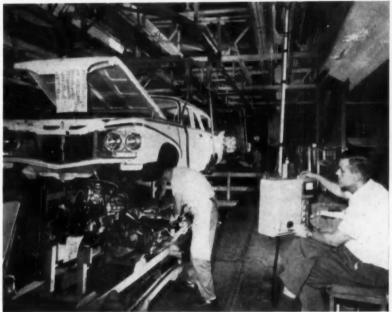
One of the points at which the body leaves the floor conveyor to ride over-head. The frame trucks may be seen making the return loop to their starting point.

-MIDDLE

Junction of the chassis conveyor and body line. Both conveyors are moving to the foreground, the chassis conveyor coming up to floor level. The operator at the right is responsible for synchronizing the two conveyors by varying the speed of the body received. conveyor loop.

The assembly line at the point of at-tachment of wheel and tire assemblies. The operator stands in a well below the level of the floor conveyor to facilitate installation of the wheel.









Perspective view of the final assembly line. This line runs some 1900 ft.

View at the right shows start of the final car paint repair line. Cars come in on the floor conveyor which terminates at this point. Meanwhile, another conveyor, transporting the frame trucks, comes up to floor level. Both conveyors are synchronized to make the transfer fully automatic.

clamped securely in preparation for body assembly.

Integration of the body starts with the welding of the two sections of the underbody while on a conveyor to provide the backbone of the car. The underbody then is fastened onto a special truck or dollie, the conveyor line dips under floor, makes a 180-deg turn and comes up to floor level for the start of body assembly. The conveyor is traversed by gate lines on both sides to facilitate the joining of side panel assemblies to the underbody and roof panel. Welding is done with the units moving on the conveyor, the gate fixtures taking the place of conventional welding bucks.

Bodies then transfer to the bodyin-white conveyor system, emerging on schedule for alignment in the body-in-white bank. From this



bank bodies are scheduled into the paint shop, the first operation being a trip through the Bonderite unit. Just ahead of the entrance to this unit the body leaves the dollie and the latter, still on the floor conveyor, makes an intricate bend within a short space for its return trip.

Car assembly starts at the opposite end of the building at the receiving station for stub frames. We

may note at this point that Plymouth unitized bodies employ a stub frame, carrying the front suspension and powerplant, which is fastened securely and permanently to the front end of the body structure. One of the unique features of Plymouth final assembly, doubtless a first in the industry, is that the mechanical operations-fastening, adjustments, and final test procedures as well as mechanical repair -all are accomplished with bodies without glass, except for windshield, and without headlining and soft trim. Plymouth management decided in advance that this procedure would preserve the trim in new condition and would eliminate the usual cleaning operations after testing

Returning to the stub frame: it proceeds on an overhead conveyor during inspection and preliminary operations and is joined by the rear axle assembly. Then at a junction point the parts are transferred onto the floor conveyor which carries the large chassis fixture on which the chassis parts are integrated. As the chassis conveyor progresses along the line, the rear axle is fitted with rear springs and other fittings, front suspension elements are mounted to the stub frame, and the power plant is installed in the stub frame. Power plants are received on a feeder conveyor from the adjacent engine dress-up line.

All running gear units are installed either loosely or permanently during this process. This includes the drive line, which is attached securely; and the exhaust system, which is secured at the engine but loose at the rear end. In substance, the entire running gear assembly is "buttoned-up" as completely as is possible for a unitized installation.

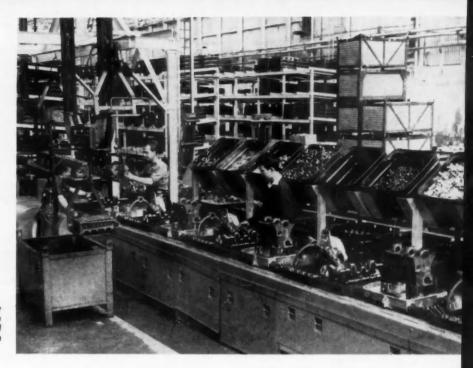
When the chassis conveyor reaches the end of the line, it dips under the floor, makes a 180-deg bend, and comes up to floor level. As it emerges on the line parallel to its original course, it meets the body conveyor transporting finish-painted bodies. At this junction there is a serious problem of syn-

(Turn to page 78, please)

Austin Production Highlights

PART II

At the start of the engine assembly line, sets of components stocked in angled bins are sorted into fitted trays trailing the cylinder blocks on individual pallets.



A SSEMBLY of the ADO.15 engine is on a continuous flow-line basis, with the cylinder block carried on the same universal tray-like pallet throughout the build-up, motoring and mating with the gearbox. Following Austin practice, a complete set of parts is laid out in a fitted tray that trails each engine on the long, straight conveyor, rather than feeding com-

ponents in progressively at appropriate points on the line.

While blocks are brought in by monorail, stocks of parts are maintained in easy-access bins flanking the beginning of the conveyor. They are sorted into the trays, as are the aluminum gearbox end-cover and clutch housing. The block starts out head-face down on its individual tray, which can be swivelled on the conveyor to ease access. After the crankshaft and other underside parts are added it is inverted on the pallet and assembly progresses on the upper side.

As basic engines in an upright position approach the motoring section, their pallets are swung through 90 deg so that the crankshaft lies across the track with the fan pulley to the rear. Nine electrically-driven motoring units with integral oil pumps circulate on this continuation of the track, being advanced by drag chain and synchro-

This is the final installment of a two-part article. Part I appeared in the March 1 issue of AUTOMOTIVE IN-DUSTRIES, starting page 41.

By David Scott

Special European Correspondent for AUTOMOTIVE INDUSTRIES

nized with the speed of the incoming engines.

Elevators at both ends link the track to the under-bed return conveyor. Each engine pallet (with trailing parts tray) leaving the assembly belt is simultaneously aligned and coupled by an arm on the motoring unit just reaching the track. As the two assemblies creep forward, angled guide bars or straight cams on the bed thrust the motoring unit a few inches transversely so that the driving spindle engages the head of the large retaining bolt for the belt pulley.

At the same time an oil nozzle is pushed onto a connector pipe extending from the pallet base. Meanwhile, a flexible hose is manually fitted between the inner end of this pipe and the oil pressure gage hole in the cylinder block, and the water jacket is filled with coolant.

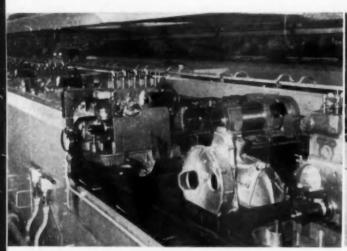
With further travel of the tan-

demed units electrical contactors wipe bus bars paralleling the rear of the track, and the motor starts up to drive both engine and oil pump. Lubricant is sucked up by an inlet tube dragged through a trough beneath the wires at the back, and is discharged from the engine through the uncovered crankcase to drain into a channel under the track, where it is filtered before re-use.

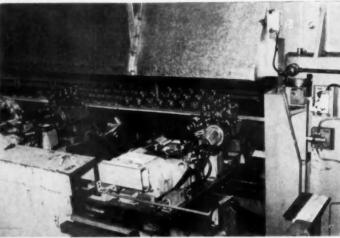
Each engine is driven and flushed for 12 minutes, and disengagement at the end of the line reverses the coupling procedure at the start. The bus bars terminate, straight cams slide the motoring unit rearwards across the track, and a ramp raises the trailing oil tube out of the trough while an air ram pushes its swivelling junction pipe to compact it into its housing.

As the motoring unit reaches the end of its travel it operates a limit switch to actuate the descending elevator that lowers it to the return conveyor. Departing engines on the outgoing conveyor are again inverted on the same pallets by a turnover hoist, so that the crankcase is uppermost ready to receive the gearbox.

The transmission assembly line is on an adjacent parallel track where components are advanced on similar fitted trays conveyed behind the main aluminum housings



Engine pallets entering the metoring line are first turned 90 deg, then locked to the moving drive units that are guided transversely across the track by straight cams so that the drive spindle engages the central bolt retaining the crankshaft pulley.



As motoring units reach the end of the line they are disengaged from the engine by withdrawal across the track. Electrical power is cut off when the wiping contactors reach the end of the busbars, and oil flow is stopped by a ramp that raises trailing intake tube out of supply trough.

on their pallets. A high standard of cleanliness is maintained for this critical unit, and completed sets of components leaving the parts marshalling area are conveyed through a Dawson washer just before assembly begins.

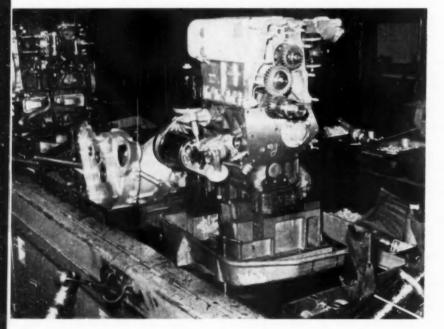
Build-up includes adding the countershaft, input gear cluster including the final-drive pinion, and selector forks. A pair of roller bearings is then inserted in the separate differential housing by a

hydraulic press stationed by the line, and the pre-assembled differential is put in place.

This housing is now bolted to the left side (actually the rear, considering the transverse engine mounting) of the gearbox casing so that the helical spur gear engages the internal pinion. The gear shift lever in its own extension housing is bolted to the differential, and finally the Hooke-type bondedrubber universal joints are attached to the opposed input shafts.

Completed transmissions are then briefly motored and flushed by a flexible drive and oil hose overhanging the line, while the gearbox is manually shifted through the ratios to check operation. The transmission conveyor ends at a point just beyond the engine motoring section, and at present the 60-lb assemblies are transferred by hand to a roller track leading to the engine line a few yards away. Duplicate lines for both units are under construction, and when they are completed an overhead monorail will convey transmissions to the engines.

Inverted gearboxes are now lowered onto the upturned crankcase face of engines cradled on their moving pallets, location dowels insuring precise alignment before bolting. The primary drive sleeve is fitted over the crankshaft tail and retained by a horseshoe key, the intermediate gear is meshed with it and the gearbox input cog, fllywheel and clutch are secured, and the end-cover and flywheel housing are bolted on.



After merging of the transmission and engine assembly lines, the gearbox is lowered on the inverted cylinder block cradled in its universal pallet. The mating faces are positioned by location dowels before bolting to insure exact alignment of the external gear train.

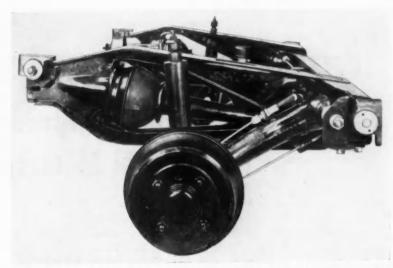
After addition of the starter motor and other under-side auxiliaries. the combined assembly is hoisted off its original pallet and inverted right side up on the fitted parts tray, which has a fixture conforming to the shape of the gearbox sump. Engine detail is completed from here on, including positioning of the valve rocker cover marked "Austin" or "Morris" according to the destination. These power plants are then transported by trailertruck to the Morris factory at Oxford or to the main assembly hall at the Longbridge plant.

The final Austin assembly line starts with the placing of the front and rear sub-frames on the pedestal fixtures on the slat conveyor. Rubber cone suspension members are positioned horizontally at the rear, and the tapered strut or pushrod that compresses each cone is coupled to the nylon-seated ball joint on the independent trailing link that is attached at the same time.

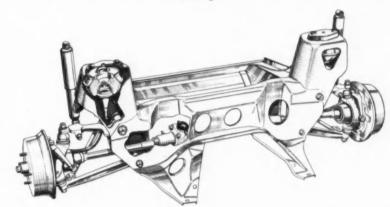
The engine-gearbox unit is dropped onto the front frame, where it is supported by two rubber mounting blocks on each side. (These are under the clutch housing and a special bracket extending forward from the front of the transmission casing; a rubberbushed tie-rod between cylinder block and body cowl is later added to provide three-point stability and take torque reaction.)

Similar rubber front cones are inverted inside raised supports welded to either side of the frame, while their tapered struts extend downward for coupling to the upper suspension link. Before seating the ball-tipped strut against this arm and assembling other suspension members, the rubber cones are pre-loaded by a pair of pneumatic rams. A bolt is temporarily threaded into the tapped metal center of the cone, and the ram carried on an overhead counterbalance is locked over the bolt head.

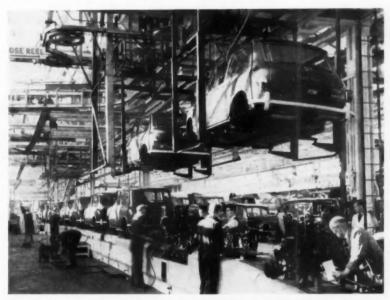
With the rubber compressed, the upper link with its needle-roller bearings is installed, as is the lower link and the ball-jointed steering knuckle between them. When the cone is released the drive shafts to each front wheel are bolted to the (Turn to page 78, please)



Lateral view of the ADO.15 rear sub-frame, showing the horizontally-mounted rubber cone suspension unit that supports the trailing arm with a 5 to 1 leverage,



View of the front sub-frame with vertically-disposed rubber units coupled to the upper suspension links.



Front and rear sub-frames on the final assembly lines are aligned by jigs prior to the dropping station where trimmed bodies, carried on overhead slings, are lowered and bolted in place.

RELIABILITY PROGRAM

at Rochester Products Division of General Motors Corporation

RELIABILITY a term popularized by missile-men in recent years, marks a new concept in the manufacturing field. In the case of a missile, the malfunctioning of even one small part or joint out of some 300,000 components can cause failure or carry the missile off its course.

For many years the vehicle producers as well as component suppliers have devoted time and money to the improvement of quality through a variety of inspection procedures and quality control. Despite the most heroic measures, however, we all know that the buyers of vehicles still have troubles—minor or major—and these are irritants that can make or break a supplier or vehicle producer.

After considerable probing and study of the various aspects of product quality, the Rochester Products Division of General Motors has decided definitely that the quality control concept as it has been accepted is not good enough to meet the current problem. They feel there is a need for a new approach, one that embraces not only a concept of product quality but proper functioning and endurance as well.

RPD, therefore, has embarked on an overall RELIABILITY concept which will pervade every phase of its operation, including engineering design, manufacturing, purchasing, management, and service.

Stated simply RPD intends to produce a quality product that can be depended on to do what it is

By Joseph Geschelin

DETROIT EDITOR

supposed to do; where it is supposed to do it; and as long as it is supposed to do it. To achieve this goal requires an integration of the efforts of the entire organization, including an awareness on the part of each worker of the importance of his specific task to the overall objective.

It may be noted at this point that the objectives of the program must be achieved without penalizing cost and operating economy. This marks a serious management problem: the job must be done with available facilities and manpower through a better use of such facilities by attacking the problem from a fresh perspective.

In practice, RPD's reliability program depends upon some formal machinery designed to reach every phase of the operation. First there is a Reliability Board, the overall management group, consisting of the following:

- Director of Reliability and Chairman of the Board.
- 2. Director of Purchases.
- 3. Director of Production Engineering.
- 4. Manufacturing Manager.
- 5. Chief Engineer.
- 6. Sales Manager.

Implementing the Board is a Reliability Task Force consisting of the following:

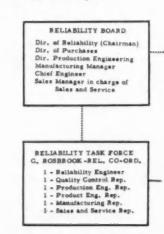
- 1. Reliability Coordinator (permanent assignment).
- 2. Reliability Engineer (permanent as-

- 3. Production Engineering representa-
- 4. Product Engineering representative.
- 5. Manufacturing Department representative.
- Sales and Service Department representative.
- 7. Quality Control Department representative.

Broadly speaking, the function of the Reliability Board is to review the recommendations of the Task Force; and to institute appropriate action if such action has not been realized by the Task Force. The Board sets all policy and may make recommendations for reliability studies. Since the Board is responsible only to the General Manager of the division, it has overriding authority in dealing with any problem. Hence

RELIABILITY PROGRAM ORGANIZATION CHART

This indicates degree of penetration of the entire plant

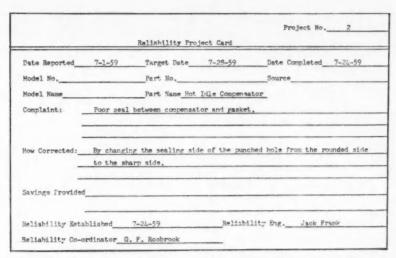


its recommendations are binding and cannot be ignored.

The Reliability Task Force, on the other hand, is concerned with all of the detail problems that filter in from the customer, the plant, the field, or any other area where a problem exists. It has the authority to request data and tests of any character from any area of plant operation.

The Reliability Program embraces the following major activities:

- Examination of check lists compiled daily by inspection personnel.
- Investigation of all sources of complaints, from the outside and from within the plant, compiled on a Reliability Evaluation card.
- 3. Examination of routine daily reliability data.
- 4. Conducting of life tests on existing facilities.
- 5. Reliability design review at meetings called by the Coordinator to appraise design simplification, design standardization, design profitability. In addition, customer satisfaction is appraised in the light of current as well as new products.
- Establishment of failure tests and other kinds of tests on advanced designs before they are frozen for production.
- 7. An educational program among all management personnel as well as individual workers. This involves training programs with visual aids. An adjunct to this is an interesting cartoon type film with sound that spells out the features of the entire concept.
- 8. Evaluation of projects in the light of the proper ratio of reliability assurance costs to product and manufacturing costs.
- Submitting progress reports to management once a month.



Example of Reliability project card used for getting action on a specific complaint. The reverse side of the card gives a record of corrective action.

In the day-by-day operation of Reliability, the Coordinator keeps in touch with engineering; with manufacturing—to follow up on reliability projects, and establishment of special methods and equipment; with quality control—to improve line inspection, analyze quality control statistical data, evaluate research and testing; and with field service—to determine customer reaction, and evaluate periodic field reports.

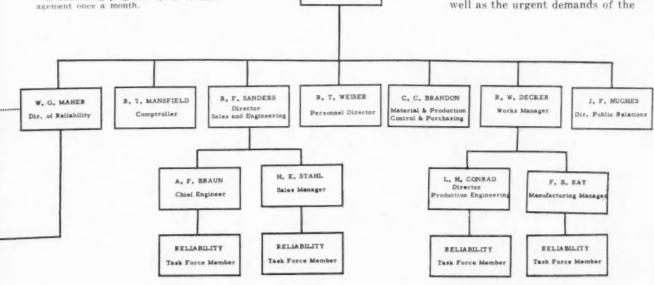
RPD looks at reliability from

W. E. WILSON

General Manager

two different aspects: how reliable is current product; and how reliable will be the new products now in planning. In the evaluation of the current product, one of the tests is a check list of potential causes for rejection. Once established, this check list becomes a guide to inspection for use in the daily check of products ready for shipment.

The second phase, which is even more important, is the determination of the reliability of a new product prior to production release. It is recognized that in the rush of releasing new models, as well as the urgent demands of the



customer, an unreliable design is sometimes released for production. To reduce this hazard, the Task Force is required to look in advance on engineering design for potential trouble spots, and to see that life tests and performance tests are conducted at the earliest moment on first production runs.

Finally it may be noted that actions taken by the Task Force are based upon majority rulings and that all members are bound by the majority decision. The decision of the group becomes final on all questions of reliability, except where overruled by the Board.

The foregoing is necessarily only a sketchy outline of RPD's reliability program. The program is based upon a considerable period of preliminary study, and will operate in conjunction with a parallel activity in Operations Research to provide a total organizational background philosophy for the new system.

A great deal has been learned even in the present early state of the operation. For example, RPD considers reliability in every sense. If customer service is not prompt or if quotations are not handled quickly, its reliability as a source is questioned. Consequently, steps have been taken to speed up these services. As a result of initial work RPD has turned up the need for special research and development facilities necessary to a more complete control of product reliability and customer service. For example, the division has doubled the size of its test facilities at the General Motors Proving Ground in Michigan; and a new building is being constructed at the GM Desert Proving Ground to serve as headquarters for its hot weather carburetor and fuel injection development work.

One important lesson that has been learned is that the reliability program does not necessarily mean higher costs, nor does it mean that additional personnel and services necessarily are re-

ROCHESTER PROD	UC	TE	3		Report No.								
Chevrolet-Pontiac Reliability FUEL							Part No.						
			3		Nodel								
Daily Visual Checks	1	2	3	h	5	6	7	8	9	10	"r"		
cose sermia on flance													
cose Cover Bolt													
hreads Inlot Hole													
hreads Outlet Hole													
racked or Porous Castings													
efective Rocker Arm Assy.													
ilter Hair Visible													
orrect Vent Roles													
ounting Holes O. K.													
ocker Arm Spring													
ocker Arm Pin Stoking													
rt Number Visible													
ime Test 6 120RPM 12 sec. Box.													
essure Test @ 1800mpu 5 1/4-6 1/2 PSI													
ak Test @ 5 1/2# pressure													
sc.													
ekly Checks on 4 Pumps													
nctional Test;													
No. strokes to prisca25 rox.@ 60RPM													
Mis. Capacity 30 gal. @ 1800RPM													
Running pressure 4.0# PSI													
Static Pressure @ 1800=5 1/4-6 1/2PSI													
fe Test:100 hrs. min.=6000 miles													
ardown Inspection:													
Excess Diaphragm wear													
Oil seal leaks oil													
Protector rub on cover													
Disphragm staking													
Excess wear-Rocker Arm													
Diaphragm or R. A. springs broken													
Torque Test Flange Screws													
Other Visual Defects or Wear													

An example of the checking sheet set up for a specific assembly—the fuel pump in this instance. It gives the inspector a complete list of details to look for in assuring reliability.

quired. In fact, the test of its practicability as well as of the skill of the management lies in the ability of imparting the new idea to existing personnel so they will handle their jobs from a different viewpoint.

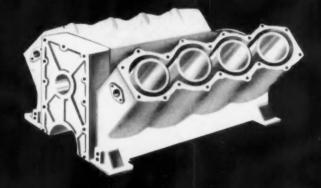
This simultaneous attack on materials, methods, tooling, inspection, testing, design, and all of the other facets of a large manufacturing operation should result in a better and longer lived product. It is important too that the entire stress is on people. People in management; people on the machines and test benches. Regardless of the theorists, neither machines nor methods alone can achieve the desired goal without the support and cooperation of the individuals involved.

Changes Name

The Inter-Industry Highway Safety Committee has changed its name to Auto Industries Highway Safety Committee. Its offices are at 2000 K St., N. W., Washington D. C.

Chairman Named

Elmer W. Dunn, traffic manager, Lockheed Corp., Georgia Div., has been elected chairman of the Eastern Regional Traffic Committee of the Aerospace Industries Association.



How Aluminum Engines

cut weight, improve
performance, reduce
manufacturing costs



ALUMINUM ENGINES

in two 1960 automobiles—one a compact U. S. car, one a luxury English car—are this year's biggest automobile news. The difference between these two cars—in design, in size, in motoring features, in price—is great. Yet the fact that both of them are powered with aluminum engines proves automobile experts agree that the greatest enemy to efficiency is weight. And the new aluminum engines are a big step in automobile weight reduction.

Reduced Weight - Better Performance

The aluminum engine block can save as much as 75% of the weight required by the old cast iron blocks. This weight saving, plus the resulting savings in chassis, cooling system and other parts, can reduce dead weight by as much as 450 – 500 pounds per car. With this much less dead weight to haul, aluminumengined cars will deliver better gasoline mileage, will accelerate faster, stop quicker, ride better. There'll be less wear on brakes and tires, more responsive handling, better control.

Lower Manufacturing Costs

Automotive engineers agree that aluminum engines will cost less to produce than cast-iron engines, even though the per-pound basic material cost of aluminum is higher. One big reason: there is about three times more metal in a pound of aluminum than in a pound of iron. Six V-8 engine blocks can be cast from a ton of iron—and nearly sixteen from a ton of aluminum. And, lightening of the chassis permitted with aluminum engines will also help cut production costs.

Savings in shipping costs are substantial, too. It costs much less to ship aluminum engines than it does to ship iron engines.

Aluminum's workability and light weight also reduces machining and finishing and assembling costs far



below those for iron and steel. Aluminum is ideally suited to automation and other cost-cutting production techniques.

Aluminum Engines and Automotive Engineers
One of the most intriguing aspects
to automotive engineers currently
working on aluminum engines is the

opportunity aluminum provides to design out established concepts. The engine itself may be shaped much the same as a conventional iron engine or it may be in a pancake or other shape. It may be designed for liquid-cooling or air-cooling. It may be designed for front mounting or ear mounting. And as cylinder head and block designs develop, there also develops a chain of new design concepts in drive line and chassis areas.

Aluminum Service From Reynolds

Reynolds is proud to be the major supplier of aluminum for America's first mass-produced aluminum automobile engine. Reynolds Aluminum Specialists are at your service to help you get the very most from the aluminum you use-whether it be for engines or for other functional or decorative parts. For details contact Reynolds Sales Office at Northland Drive and Northwestern Highway, P. O. Box 5050, Seven Oaks Station, Detroit 35-phone KEnwood 7-5000. Or contact your nearest Reynolds Office or write Reynolds Metals Company, P.O. Box 2346-MV, Richmond 18, Va.

NOTE: Before you buy any part—have it designed and priced in aluminum. Basic material costs do not determine part costs. New techniques and processes—applicable only to aluminum—can give you a better product at a lower final cost.

Watch Reynolds TV shows—"ALL STAR GOLF", "BOURBON STREET BEAT" and "ADVENTURES IN PARADISE"—ABC-TV

Reynolds



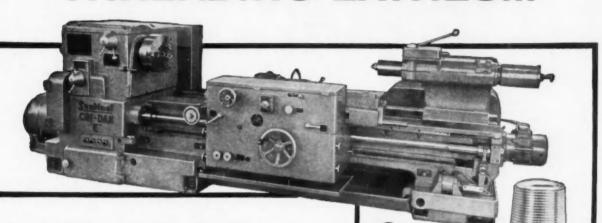
Aluminum

the metal for automation

CRI-DAN

(Semi-Automatic Single Point)

THREADING LATHES...



faster than thread grinding or milling...handles toughest jobs on hardest materials at less cost-distributed by

GISHOLT

Widely used throughout Europe and rapidly gaining favor in the U.S.A., CRI-DAN High-Speed Threading Lathes offer outstanding advantages on a wide variety of threading work. Using single-point carbide tools and positive, cam-controlled movements, CRI-DAN provides very accurate lead and thread form on all types of internal and external threads, including multiple-start, coarse, fine, left- or right-hand, parallel or taper, with metric or inch pitches. Highest production, accuracy and fine finish are assured on even the most difficult materials.

With simple operation and 15 minute change-over, CRI-DAN is an extremely versatile machine capable of handling an amazing range of components at high production rates. Single-point carbide tools, easily resharpened or replaced, cut tooling costs to a minimum.

Two models are available with a full complement of accessories to meet your needs. Ask your Gisholt Representative for full details or write



Investigate Gisholt's Extended Payment and Leasing Plans

Turret Lathes • Automatic Lathes • Balancers • Superfinishers
Threading Lathes





from creative Crucible

Where a fine finish is only the beginning

The lustrous beauty and unsurpassed finish of Crucible stainless steel will enhance the sales appeal of any product. Crucible's experienced metallurgists can help you select the most suitable type, form and finish, and the most efficient technique for fabricating. Add to this the convenience of Crucible's nearby steel service centers (34 throughout the country) and you'll find Crucible an unbeatable combination - for superior steel ... service ... and supply.

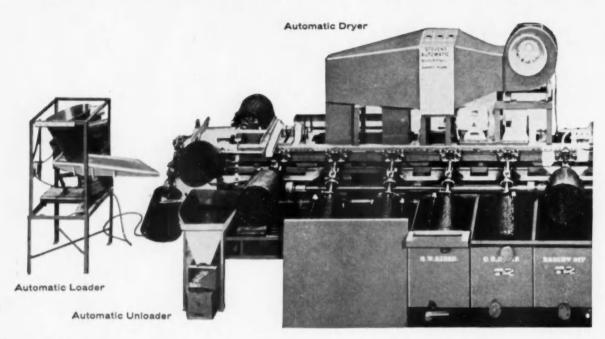
CRUCIBLE

Stainless Steel

SHEET, STRIP, ROD AND WIRE BY CRUCIBLE STEEL COMPANY OF AMERICA PITTSBURGH 30, PA.

Circle 124 on Inquiry Card for more data

every 16 hours 2 million pounds of small parts are being plated or processed* in STEVENS AUTOMATIC BARREL MACHINES



*washing, burnishing, phosphating, bright dipping

It's a fact! Every working day a tremendous tonnage of small parts is being plated or processed in Stevens Automatic Barrel Machines. Why? Because Stevens builds the only barrel machine on the market today that provides complete automation.

AUTOMATIC LOADING...AUTOMATIC UNLOADING
...AND AUTOMATIC DRYING... are all within
the machine. No extra equipment or floor space is required!
When you think of truly automatic plating or processing,
think of Stevens. Only Stevens can give you—

COMPLETE AUTOMATION . LOWEST COST PER PIECE EXTRA SIMPLICITY OF OPERATION AND MAINTENANCE EXTREME MECHANICAL FLEXIBILITY

Write today for complete information on this processing profit-builder.

frederic b.

STEVENS, inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)



Who Buys Roebling Upholstery Spring Wire After You Do?

The end-user can hardly be expected to know a great deal about Roebling helical spring wire, border and brace wire, zigzag and no-sag wire, wire for automatic machines, lacing wire . . .

Thus, the qualities of uniformity, temper, tensile strength, size and finish that are yours whenever you use Roebling Spring Wire mean long life, resiliency under constant use (and abuse) where it counts the most...to those who buy Roebling Upholstery Spring Wire after you do.

For further information on the wide

range of types, the consistent superiority and availability of these and other Roebling wire products, write Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

Roebling ... Your Product is better for it

ROEBLING

Branch Offices in Principal Cities John A. Roebling's Sons Division The Colorado Fuel and Iron Corporation

Hands of the Giants

or shape
a missile

of pressure—so delicately controlled that it can be made to crack the shell of an egg.

Use the fabulous forces of present day forging skills to crack the barriers of space—weight, strength, high temperatures.

Forge the future, today.



WYMAN-GORDON

FORGING

ALUMINUM

MAGNESIUM

STEEL TITANIUM

BERYLLIUM

MOLYBDENUM

COLUMBIUM

AND OTHER UNCOMMON MATERIALS

WORCESTER, MASSACHUSETTS

HARVEY, ILLINOIS

DETROIT, MICHIGAN

GRAFTON, MASSACHUSETTS FORT WORTH, TEXAS

FRANKLIN PARK, ILLINOIS

LOS ANGELES, CALIFORNIA

60

Circle 127 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES, April 1, 1960

Machine Tool Builders Report Steady Business Trend

Al QUARTERLY SURVEY Indicates—
Little Change from Recent Rate of Bookings
During Period Preceding The Exposition,
and Then Marked Gains in the 4th Quarter

ROR the 1st Quarter of 1960, new machine tool orders, booked by companies reporting on the AUTOMOTIVE INDUSTRIES quarterly survey, have apparently continued at close-to the 2nd Half 1959 monthly average—following the rise in sales which started just about a year and a half ago.

Order backlogs now in the hands of the machine tool builders are generally higher—about eight per cent—than they were at January 1. And at January 1, 1960 they were substantially double those at January 1, 1959.

Inquiry activity now is essentially the same as at January 1—and at that time the inquiry activity was much higher (40 per cent or more) than the activity at January 1, 1959.

Prospects for automotive business look good to most companies—while 25 per cent report a "disappointing" picture.

The overall outlook for new business during the next six months, compared to the past six months, is "about the same." Many feel that way, while nearly one-third of the companies predict business will be up an average 15 per cent, and one-fifth of them say business will drop off slightly.

Deliveries of machine tools are slightly longer now than at last October—and six months from now (October 1960) may still be

By Charles A. Weinert

EASTERN EDITOR

at the present rate. If otherwise, deliveries then will be extended further—perhaps as much as 20 per cent, in a few instances.

The Machine Tool Exposition—1960, slated for September 6-16, is likely to have two influences on business placement during the forthcoming months. It may, to a limited extent, adversely affect the placement of new business prior to the exhibition. On the other hand, the Exposition will undoubtedly create a lot of interest in machine tools with the display of new and more-productive models, stimulate sales, and result in substantial gains during the 4th Quarter 1960 and 1st Quarter 1961.

The foregoing, in brief, are the conclusions which can be drawn from the business survey of the machine tool industry just completed by AI editors. They represent the combined viewpoints of 20-odd leading machine tool executives, considered a typical cross-section of the industry.

It should be pointed out, however, that the situations of individual companies do differ widely when compared one with another —and, if considered individually, will in most cases be at variance with the aggregate industry picture.

This report, incidentally, supplements and up-dates the results of the survey conducted last December, presented in AUTOMOTIVE INDUSTRIES for January 1, 1960.

Typical replies from machine tool executives, in answer to specific questions asked in the current survey, are quoted in the following. It will be of interest to note their comments on the aspects mentioned above—including their views on the probable impact of The Machine Tool Exposition-1960—as well as their recommendations to automotive users of machine tools.

Present Sales Picture

Question: Is the volume of your order backlog now greater than at January 1, 1960; also how does it compare with that of a year ago? More inquiry activity now?

Durwood A. Blaisdell, executive vice president, The Baird Machine Co.—"Our volume of unfilled orders at the present time is greater than at January 1, 1960, and it is up approximately 25 per cent. Our volume of unfilled orders is up approximately 40 per cent over that of a year ago at this time. We are experiencing considerably more activity as far as our incoming inquiries are concerned. The activity is much better than that of a year ago."

Warren C. Olson, president, Besly-Welles Corp.—"Our backlog at present is about the same as January 1, 1960, but about double a year ago as the surge in machine tool orders started in about May, 1959. Inquiries at present are about the same as at January 1."

E. H. H. Graf, vice president, sales, Detroit Broach & Machine Co.—"Our order backlog at the present time is approximately 25 per cent greater than as of January 1, 1960. It is three times that of a year ago. Inquiries are about the same as they were January 1, 1960, and are much more solid than they were a year ago."

George Gorton III, president, George Gorton Machine Co.—"Order backlog is presently comparable to that of January 1, 1960 and three times greater than a year ago. Incoming inquiries are presently the same as at January 1, 1960, which compares approximately in volume with that of a year ago which was at an all-time high."

H. A. Finch, manager of marketing, Jones & Lamson Machine Co.

—"Our volume of unfilled orders is presently somewhat lower than it was January 1, 1960, but is approximately double that of a year ago. New inquiries are being received at a rate substantially higher than a year ago, but at about the same rate as of January 1, 1960. The increased activity is on the order of about 25 per cent over a year ago.

W. C. Rosborough, executive

vice president-treasurer, Moline Tool Co.—"Backlog now is about five per cent less than on January 1, 1960, and five times what it was one year ago, but it should be noted that volume was awfully small in early 1959. Inquiries seem to be at a somewhat lower level than at January 1, 1960. Volume of inquiries is about the same or possibly less than one year ago."

E. M. Hicks, vice president, Norton Co.—"Our backlog is practically unchanged since January 1, 1960. It is nearly 60 per cent higher than a year ago. Our current inquiry activity is less today than either two months ago or a year ago."

Automotive Business

Question: How active, this year, are the requirements for machine tools in the automotive industry?

Warren C. Olson, president, Besly-Welles Corp. — "Considerable interest is being shown by the bearing and piston ring companies at present."

E. H. H. Graf, vice president, sales, Detroit Broach & Machine Co.—"I would say that late 1960 and early '61 should be fairly heavy commitment periods for machine tools by the automotive inquestry."

Company Spokesman—"Machine tool requirements in the automotive industry this year have been very small so far as we are concerned."

H. A. Finch, manager of marketing, Jones & Lamson Machine Co.

"There seems to be every indication that the automobile industry will place a fairly substantial amount of business with the machine tool builders this year. Most of this business, as far as we are concerned, appears to be replacement rather than expansion; although there will be some activity in the small compact cars which could be considered as expansion."

W. C. Rosborough, executive vice president-treasurer, Moline Tool Co.—"Can't tell much about this, but from our viewpoint the automotive requirements have never returned to where they were in 1956."

J. P. Crosby, vice presidentsales, The Lapointe Machine Tool Co.—"The automotive industry requirements for machine tools are 25 per cent better than they were a year ago."

N. M. Forsythe, president, National Automatic Tool Co., Inc.—
"Our own activities on behalf of the automotive industry are almost twice as great as a year ago."

Business Outlook

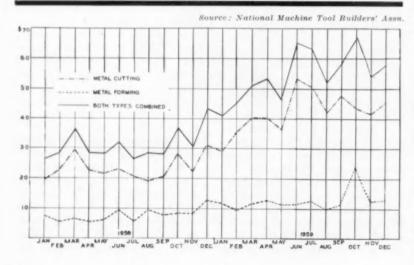
Question: What is your forecast for new business receipts during the 2nd and 3rd Quarters of 1960, compared to 4th Quarter 1959 and 1st Quarter 1960?

Durwood A. Blaisdell, executive vice president, The Baird Machine Co.—"Based upon the present volume of inquiries, it appears to us that our business will continue to hold up through the 2nd and 3rd Quarters of this year, as far as our incoming orders are concerned, and will equal or be better than the 4th Quarter of 1959 and the 1st Quarter of 1960."

E. H. H. Graf, vice president, sales, Detroit Broach & Machine

METAL CUTTING AND FORMING MACHINE TOOLS Net New Order Receipts—By Months

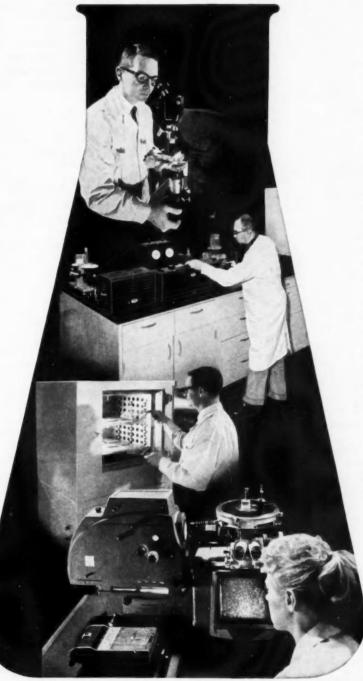
(Millions of Dollars)





better batteries today-

New power supplies for tomorrow!



The 60's! Exciting, startling, enriching! Years of new advances in industry, new milestones in science, new secrets of power unlocked, a completely new standard of living for us all.

Globe-Union looks forward to the 60's - its challenges, its rewards. With a recently completed ultra-modern research center, Globe is confident of the major role it will continue to play.

Already, Globe's new technical center is carrying on advanced studies in electrochemical systems and thermodynamic reactions through x-ray spectroscopy, radiography and microscopy. In the new radio-isotope laboratory, tracer amounts of radioactive isotopes expose the course of electrochemical corrosion reactions in battery components.

A raw materials test laboratory integrates Globe's quality control program. Here incoming raw materials from Globe's 16 battery plants are precision tested.

Yes, in the 60's Globe will build even finer batteries than the best of today. And beyond the horizon? Perhaps new fuel cells, new electrochemical systems, new power sources!

Wonderful years, these 60's!



GLOBE-UNION INC.

If it's Petroleum-powered there's a GLOBE-BUILT BATTERY right from the start!

Co.—"I think it is possible that forecasts for the 2nd and 3rd Quarters of 1960 may be slightly lower than the 4th Quarter of 1959 and the 1st Quarter of 1960."

George Gorton III, president, George Gorton Machine Co.—"We estimate new orders during the 2nd and 3rd Quarters of 1960 will be up 10 to 15 per cent as compared to 4th Quarter, 1959 and 1st Quarter, 1960. This forecast is largely based on new products which we have or will introduce, and may not be general in the industry particularly with respect to 3rd Quarter of 1960."

E. M. Hicks, vice president, Norton Company — "Our forecast for new orders during the 2nd and 3rd Quarters of 1960 is that they will be about comparable to those we received in the 4th Quarter of 1959 and the 1st Quarter of 1960."

N. M. Forsythe, president, National Automatic Tool Co., Inc.—
"We expect incoming business to continue at about present levels."

Ralph A. Breitung, secretary and assistant to the president, Giddings & Lewis Machine Tool Co.—"We hope the volume of new orders for the 2nd and 3rd Quarters will equal the 4th Quarter of 1959 and the 1st Quarter of 1960."

Frederick S. Blackall, Jr., president, The Taft-Peirce Mfg. Co.—
"Our forecast is a 30 per cent increase in the 2nd and 3rd Quarters."

Edward P. Bullard, III, president, The Bullard Co.—"We expect slightly improved business for the 2nd, 3rd and 4th Quarters, 1960 compared to 1959."

Delivery Situation

Question: What kind of deliveries can you now offer on new business, compared to six months ago? Are deliveries apt to run longer on orders placed six months from now (October)?

Durwood A. Blaisdell, executive vice president, The Baird Machine Co.—"We are continuing to quote deliveries comparable to those for the last six months. However, as the backlog of unfilled orders con-

tinues to build up, undoubtedly our deliveries will be extended somewhat."

W. C. Rosborough, executive vice president-treasurer, Moline Tool Co.—"Deliveries are slightly shorter than as of January 1, 1960."

E. M. Hicks, vice president, Norton Co.—"Like most machine tool builders, we are striving to obtain skilled labor and we are working many hours of overtime to keep up with our schedules. Our deliveries have already lengthened a little, and if our forecasts are correct, we would expect some further lengthening during the next six months."

J. P. Crosby, vice president, sales, The Lapointe Machine Tool Co.—"As our business improves, our delivery situation gets worse, and I anticipate that six months from now, with improved business, our deliveries will be 20 per cent longer. The reason for this, I believe, is that our increased business is of a type that will require a great deal of engineering, and we cannot train engineers fast enough to meet this load."

N. M. Forsythe, president, National Automatic Tool Co., Inc.—
"Despite our increased volume, we have not had to extend delivery commitments proportionately, as we are making extensive use of overtime and sub-contracting."

Ralph A. Breitung, secretary and assistant to the president, Giddings & Lewis Machine Tool Co.—"Our present position permits good delivery on smaller type equipment. This situation will probably last four to six months. We expect some extension of delivery on long leadtime items."

Frederick S. Blackall, Jr., president, The Taft-Peirce Mfg. Co.—"Deliveries are lengthening, and will continue so."

Edward P. Bullard, III, president, The Bullard Co.—"Delivery situation is unchanged and expect this to continue."

AUTOMOTIVE INDUSTRIES
KEEPS YOU INFORMED

Recommendations

Question: Do you wish to make any personal recommendations to the automotive industry—in the way of factors to be considered when planning, during the remainder of 1960, for tool acquisitions?

H. A. Finch, manager of marketing, Jones & Lamson Machine Co.
—"It would be our recommendation that the automobile companies act as quickly as possible in placing their orders if they are tied in with specific model changes."

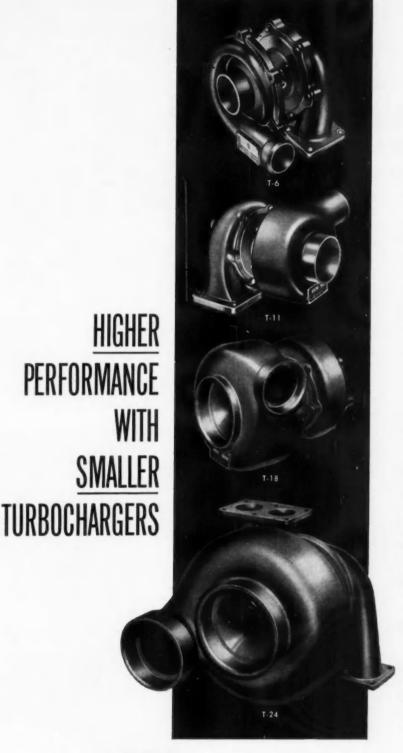
Company Spokesman—"We would suggest that the automotive industry re-establish replacement programs and maintain a more even level of equipment procurement to 1) keep up with latest technological advancements, and 2) to avoid high prices caused by cyclical demands on machine tool industry production."

Company Spokesman—"The only recommendations we would like to make have been made previously by others as well as ourselves, that designs be set before ordering so that promised deliveries can be maintained to the end user and not be held up by continued changes, and that samples for test runs be available when needed."

E. M. Hicks, vice president, Norton Company—"It would be most helpful if automotive and other customers could allow a little more time for delivery of their equipment. Crash programs are costly, both to machine tool builders and their customers."

J. P. Crosby, vice president, sales, The Lapointe Machine Tool Co.—"We honestly feel this increase (in business) will be general throughout the industry, and we urge the automotive industry, whom we feel will be largely responsible for this increase, to place their orders promptly to obtain the best deliveries. They should generally figure that machine deliveries will be in the 16 to 20-week area for the rest of 1960."

(Turn to page 90, please)



AiResearch's new line of high performance turbochargers gives higher air pressures and more flow per size and weight than ever before achieved in the turbocharging industry, while retaining the high standards of durability which AiResearch established in this field.

Designed for the 50-700 hp engine range, the turbochargers incorporate (a) low inertia, low stress, high pressure ratio impellers and turbine wheels, (b) free vortex turbine housings which eliminate nozzle rings and provide higher turbine efficiency.

Other advantages:

Lower Cost—Radically simplified design and high production tooling have significantly lowered unit cost and service requirements.

Faster Response—Lowered inertia of the rotating group has made response almost immediate. Greater Versatility—Interchangeable compressor components for each basic turbocharger housing permit a perfect matching of turbocharger to the job; and better engine matching further reduces operating cost.

These new, high performance turbochargers are readily adapted to AiResearch turbocharger control systems which insure optimum engine characteristics over

the entire range.

World leader in the development and manufacture of lightweight turbomachinery of all types, AiResearch now has more than 35,000 turbochargers in the field delivering nearly 9 million turbocharged horsepower.

Your inquiries are invited.



CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS



AUTOMATIC CONTROLS

PRODUCTION-VEHICLES-AIRCRAFT

By C. J. Kelly



A control tape which contains in binary coded form all information necessary to machine a specific part is first mounted on the tape reader of the control unit. The operator then positions the cutter manually to the setup point corresponding to the initial position on the tape and depresses the tape "start" button. Automatic machine operations then begin.

NEW TWO-AXIS NUMERICAL CONTROL SYSTEM

A new Bendix 2-axis numerical control system that controls precision turning, boring and grinding contouring machine tools in increments of 0.000025 in. is now available from the Industrial Controls Section, Bendix Aviation Corporation.

The Bendix numerical control system provides a command pulse value to each machine slide of 0.000025-in. or 40,000 pulses per in. of slide travel. This permits machining to a tolerance of 0.0001-in. in routine production of templates and machining to a tolerance of 0.0002-in. in contour boring and

turning operations on precision machine tools.

The input to the control unit is punched tape. The high speed tape reader on the numerical machine control unit permits tape reading of 300 lines per second in the forward direction and 600 lines per second in the reverse direction.

An automatic tape re-wind feature eliminates the need for an operator to manually rewind at the end of a part machining operation and allows the operator to remove the part as the tape is being re-wound.

Two decimal display position

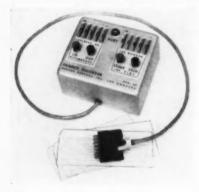
indicators with continuous readout of position location of each axis is another feature incorporated in this numerical control system. The position indicator assists in set-up operations and provides a flexible method of manually operating the machine.

Three auxiliary tape control functions are also available with the unit to automatically control such functions as coolant flow, spindle speed, and automatic grinding wheel dressing operations.

Feed rate over-ride feature incorporated in this numerical control system permits the machine operator to reduce the programmed feed rate down to as little as 20 percent of the programmed rate. Such variables as cutter quality, material hardness, vibration from fixture or tool, or a too high programmed feed rate can be taken into account without the necessity of remaking the control tape to provide reduced tool loading in critical areas.

REMOTE RECORDER

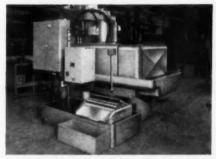
Recording of accounting and production control data is accomplished without paperwork by the new Remote Recorder developed by Digital Sensors Inc. Directly recording data onto punched cards



from the work station offers considerable reduction in clerical and direct labor time.

Employee attendance time and job allocation time, as well as production control reports, are transmitted to and recorded on punched cards. The recorder accepts variable numbers and action information.





Note how this BarnesdriL Magnetic Separator is mounted in the coolant tank of a rotary surface grinder.



Compact installation of a Barnesdrik Kleenall Combination Filter and Separator on a double disc grinder.

For Grinding, Honing, Gear-Cutting . . . or any similar operation requiring an abundant supply of clean, grit-free coolant . . . your best bet is a BarnesdriL Unit for *automatic* sludge removal. Here's why ...

Compact Design

requires less floor space . . . often permits installation of BarnesdriL Units in the machines' outside coolant tank.

No Jets. Tubes, or Screens to Clog

and impair cleaning efficiency. And, the BarnesdriL gentle action system prevents particles from being forced through the filter.

Low-Cost Filter Fabrics

actually increase in efficiency as swarf builds up on the filter media, which accounts for the low consumption of fabric on BarnesdriL Filters. Our laboratory technicians will select the correct filter fabric for your job application.

Powerful Magnetic Field

For every 5 g.p.m. coolant capacity, BarnesdriL Separators pack eight pounds of permanent Alnico magnets — the strongest magnetic attraction possible.

Three Models in a Wide Range of Capacities

BarnesdriL Kleenall Filters, Combination Magnetic and Fabric Filters, and Magnetic Separators range in capacity from 1½ to 120 gallons per minute. Specially engineered Central Systems are also available!

WRITE FOR KLEENALL BULLETIN 100 TODAY!





Honing Machines / Production Units / Filtration Units / Drilling Machines

BARNES DRILL CO.

850 Chestnut Street • Rockford, Illinois DETROIT OFFICE — 13121 Puritan Avenue

FILTRATION UNITS

News of the MACHINERY INDUSTRIES

-By Charles A. Weinert-

Program for AMTDA Meeting on April 18-20 Will Be Highly Informative. Export Trade Conference Pinpoints Major Obstacles to Sale of U. S. Machine Tools Abroad

Distributors' Ass'n Slates Semi-Annual Meeting

The 36th Spring Meeting of the American Machine Tool Distributors' Association will be packed full of interesting and timely material. Scheduled for April 18-20, it will be held at The Greenbrier, White Sulphur Springs, W. Va. Highlights of the program are as follows:

"The Economic Justification of a Machine Tool Line" — or the means of determining the true potential of a line—will be discussed by William Wolf. "More Effective Sales Control" will be the subject of a presentation by Van L. Phillips of Phillips Marketways, Chicago, Ill.

"Sales and Service in Action"—a study, in cooperative effort with the NMTBA, for more simplified paperwork—will be presented by John Haman. Management forums will likewise occupy important spots on the program.

Alan C. Mattison, president of the National Machine Tool Builders' Association and president of Mattison Machine Works, will also be a featured speaker.

Plans of both the Builders and Distributors for The Machine Tool Exposition—1960 will be presented by a panel of the three men most familiar with the programs. They are D. H. McIver, chairman of NMTBA's exposition committee; G. A. Hawkins, chairman of NMTBA's advertising and market research committee; and R. W. Nissen, chairman of AMTDA's exposition committee.

A clinic on the "Legal Problems of Distributor Selling" is another feature of the program. Joel Barlow and several of his associates will be on hand to counsel members on legal problems and recent tax developments which affect the day-to-day operations of distributors.

Export Trade Conference Discusses Machine Tools

The American machine tool industry believes its volume of export business could be improved if some of the restrictions imposed by foreign governments were

This, in essence, was the principal conclusion developed at a conference recently held in Washington, D. C., attended by 16 representatives of the machine tool industry and officials of the U. S. Department of Commerce. It was one of a series scheduled by the Department of Commerce to obtain the views of industry on the steps the Government might take to assist in increasing sales of U. S. products aboard.

Quotas and licensing in Europe were among the trade handicaps cited. Import taxes imposed in addition to tariffs also constitute a growing problem in some quarters, the industry representatives indicated. It was agreed, however, that the bgigest adverse factor is the price advantage enjoyed by foreign makers. And that this differential has hurt American exports of general-purpose tools, with the result that the backbone of present export business is special-purpose tools embodying the most-advanced technology.

The data on tariff restrictions, when supplemented by statements written by the individual builders, are expected to be helpful to American negotiators when tariff negotiations start at Geneva this fall under the General Agreement on Tariffs and Trade.

Around the Industry

Van Norman Industries, Inc.—
for the Year 1959 net sales were
\$44,469,440, profit before taxes
\$2,085,352, and net income \$1,001,126, according to the company's
annual report released last month.
For 1958, net sales were \$34,722,869, and the loss after income tax
carry-back and after extraordinary and non-recurring charges
amounted to \$1,611,658.

Nelco Tool Co.—this subsidiary of the Cutting Tool Div., Brown & Sharpe Mfg. Co., is expanding the manufacturing facilities of its plant in Manchester, Conn., with the completion of a new building addition equal in size to the original plant.

Buhr Machine Tool Co.—Robert L. Deneau has been appointed assistant to the general sales man-

Illinois Tool Works—Robert W. Beart has been elected vice-president of patents and development.

Heald Machine Co.—James N. Heald II has been appointed to the newly-created position of manager of domestic distributor sales.

Apex Corp.—Frank W. Ruprich has been elevated to the position of executive vice-president and general manager. Thomas W. Farron has joined the Apex sales staff.

Beaver Tool & Engrg. Corp.— Bernt T. Nordfjord has been made director of sales, and David D. Dresback new chief engineer.

Hamilton Tool Co.—announces the appointment of C. K. Farley, Inc., 37 Centennial St., Rochester, N. Y., as its representative in the Rochester area.

National Broach & Machine Co.

—Albert E. Forberg, sales engineer, died on March 6 at the age of 73. Death was caused by a heart attack.



UNIQUE SUSPENSION DESIGN FOR MORE SECURITY, MORE COMFORT, CONVENIENCE AND HYGIENE

in Safety Hats!

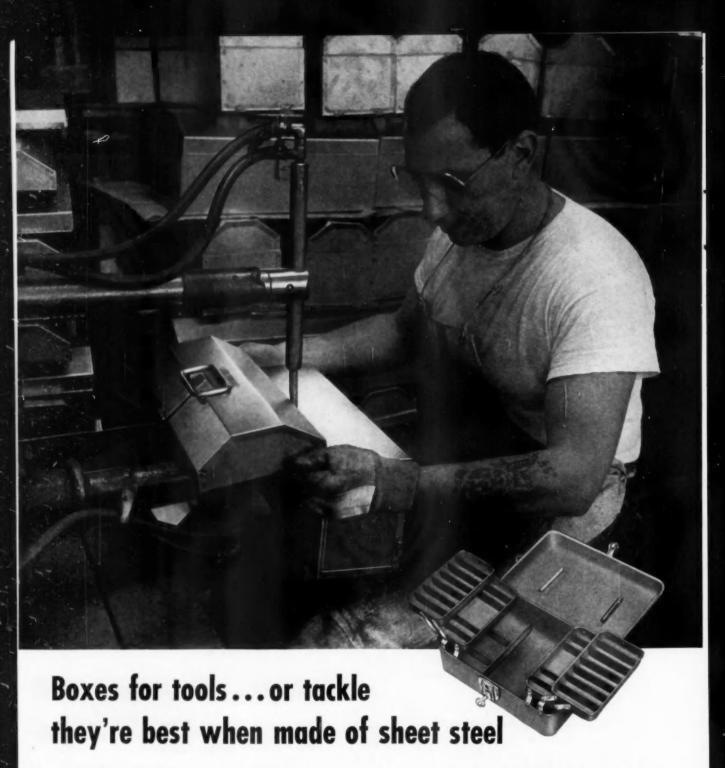
Bausch & Lomb, a world leader in industrial eye and ear protection, introduces a complete line of hard hats and caps. New suspension design increases protection, eliminates wobble, simplifies and speeds perfect head size adjustment. You replace zippered sweat bands without disturbing suspension. No buttons; no metal parts. See *all* the features of the biggest thing in hard hat value! Write or phone today for complete catalog material: Bausch & Lomb Optical Co., 98604 Lomb Park, Rochester 2, New York.

PROTECTION - PLUS Safety Products

protection + economy + worker acceptance







Strong, durable, easy to work, light in weight, low in cost—all these factors point to sheet steel as the ideal material for tackle and tool boxes. Whether you make or use such boxes, you can be sure they're best if they're made of sheet steel.

Bethlehem sheets—cold-rolled as well as Bethcon continuously galvanized—are used in the manufacture

of thousands and thousands of utility boxes. Other Bethlehem sheets go into automobile stampings, agricultural machinery, grain storage bins, metal furniture, tubing and, yes, baby carriages! We'll be glad to discuss your requirements.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation



for Strength

. . . Economy

. . . Eye-Appeal

BETHLEHEM STEEL



· · INDUSTRY STATISTICS · ·

By Marcus Ainsworth

STATISTICAL EDITOR

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

			Year	to Date
Make	Mar. 12	Mar. 5	1960	1959
PASSENGER	CAR	PRODUCTION		
Total - American Motors	11,322	11,024	104,435	81,712
Chrysler. De Soto. Dodge Imperial. Plymouth*	1,073 390 9,293 321 11,381	2,760 1,086 7,878 365 11,031	23,551 12,247 85,024 5,053 130,470	14,007 11,480 29,613 4,868 63,908
Total - Chrysler Corp	22,458	23,120	256,345	123,876
Edsel	27,921 407 6,843	27,941 403 6,106	377,915 6,419 53,307	11,454 325,793 7,476 38,431
Total-Ford Motor Co	35,171	34,452	437,641	383,148
Buick Cadillac Chevrolet* Oldsmobile Pontiac	5,250 3,810 48,367 8,083 9,488	5,660 3,776 42,468 7,077 8,227	73,842 40,229 465,514 95,732 99,040	76,561 38,022 358,602 94,900 94,470
Total-General Motors Corp.	74,998	67,208	774,357	662,555
Total - Studebaker-Packard Corp	1,971	2,696	29,939	40,771
Checker Cab	202	160	1,195	1,312
Total Passenger Cars	146,122	138,660	1,603,912	1,293,374

TRUCK AND BUS PRODUCTION

Chevrolet	10,340	10.257	108,352	81,388
G. M. C.	2,377	2,597	25,015	18,751
Diamond T	43	51	655	1,443
Divco	100	100	840	724
Dodge and Fargo	1,646	2,082	18,962	18,235
Ford	7,608	6,599	81,544	65,820
F. W. D	19	26	248	229
International	2,971	2,912	29,251	25,152
Mack	28	292	3.024	3,574
Studebaker	270	393	2,192	3,619
White	407	400	4,061	3.684
Willys	2,927	2,362	25,680	23,612
Other Trucks	85	85	790	708
Total-Trucks	28,821	28,156	300,614	246,939
Buses	35	55	805	461
Total Motor Vehicles	174,978	166,871	1,905,331	1,540,774

^{*} Plymouth includes Valiant. Ford includes Falcon production which amounted to 85,583 during January and February combined. Mercury includes Comet production which amounted to 2,240 in February, the first month of production. Chevrolet includes Corvair whose production amounted to 85,367 by the end of February.

NEW FOREIGN CAR REGISTRATIONS

.1			

1980		1959	
Volkswagen Renault English Ford Opel. Fiat Simca. Vauxhall Hillman. Volvo. Mercedes Benz. All Others.	11,973 6,077 2,809 2,370 1,954 1,426 1,339 1,165 1,138 1,007 9,162	Volkswagen Renault English Ford Flat. Simca. Opel Hillman Vauxhall Volvo Triumph All Others.	6,514 4,815 2,978 2,452 2,240 2,206 1,972 1,615 1,363 1,300 8,770
Total	40,420	Total	36,225

1960 NEW REGISTRATIONS*

NEW TRUCKS

Make	January 1960	December 1959	January 1959
Ford	18,750	21,612	17,395
Chevrolet	17,805	13,623	23,601
International	7,408	9,440	4,872
G. M. C	4,000	3,908	5,021
Dodge	2.660	3.002	3.432
Willys Truck	1.295	2.664	1.388
White	1.232	1.260	845
Mack	848	942	991
Willys Jeep	570	1.336	629
Diamond T	205	273	227
Studebaker	127	232	445
Brookway	88	111	83
All Others	3,246	3.582	3,002
	-		No. 1
Total-All Makes	58,234	61,985	61,931

NEW CARS

Make	January 1960	December 1959	January 1959
Chevrolet	102,656	69.086	106.822
Ford	102.634	126,890	96,684
Plymouth	26,946	28.583	26,624
Rambler	26,641	31,169	21.062
Pontiac	24.663	19.176	25,509
Oldsmobile	23,781	18.146	28,149
Dodge	20.086	19.382	9,889
Buick	19.021	14.660	21,659
Mercury	11.821	13.522	11.145
Cadillac	10.988	6.347	11,961
Studebaker	7,934	11,832	9,421
Chrysler	5.476	5,569	4.399
Lincoln	2,336	3,209	2.530
De Soto	2,231	2.321	3.283
Imperial	1.456	1,582	1,535
Domestic	1,006	3.417	3.854
Foreign	40,420	54,609	36,225
Total All Makes	430,116	429,500†	420,751

^{*} Based on data from R. L. Polk & Co. All rights reserved and re-use prohibited. † Does not include Hawaii.

Shipments of Tractors—For Farm Use

In Units and Their Value

Dollar Volumes are in Thousands

As reported by the Industry Division, Bureau of the Census

	1	958	1	957
Type and Hp Groupings	Units	Value	Units	Value
Wheel Type	04 000	0.54.707	45 040	
34 and less belt hp	34,980	\$ 54,787	47,363	\$ 64,147
35 to 40 belt hp	32,495	58,255	25,161	42,354
40 to 50 belt hp	40,120	82,155	51,819	90,415
50 to 55 belt hp	34,480	71,608	18,954	41,823
55 to 60 belt hp	28,626	82,402	28,738	68,121
60 belt hp and over	17,399	47,844	7,099	23,056
Total—Wheel Type	188,100	\$397,051	179,134	\$329,916
Tracklaving Type				
49 drawbar hp and less	2.569	\$ 8,858]	4.578	\$15,425
50-75 drawbar hp	640	4,438		
75-100 drawbar hp	424	4.577	1,255	16,188
100 drawbar hp and over	357	5,564		
Total-Tracklaving Type	3,990	\$23.437	5.833	\$31.613

Registered U. S. Civil Aircraft by Number of Places

	1	Number of Plane	88
Number of Places and Engines	Active	Inactive	Total
SINGLE-ENGINE † and 2 places 3 to 5 places Over 5 places	32,924 27,427 1,262	18,742 6,498 682	51,666 33,925 1,944
Total	61,613	25,922	87,535
MULTI-ENGINE 1 to 8 places 9 to 20 places 21 to 50 places Over 50 places	3,724 1,254 971 1,298	1,341 368 198 151	5,065 1,622 1,169 1,449
Total	7,247	2,058	9,305
Experimental and unknown Dirigibles Balloons Gliders	566 1 14 277	902 5 23 265	1,468 6 37 542
Total-Civil Aircraft	69,718	29,175	98,893

PRODUCTION EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

By C. J. Kelly ASSISTANT EDITOR

Measuring Instrument

NEW instrument, called the Distometer, Model 555 B-245, provides the lathe operator with a means of spotting tool position and directly measuring longitudinal cutting dis-



Instrument features push button zeroing

With this device the operator has a constant guide which operates over the full travel of the lathe carriage. that can be referenced instantly at any point in the travel with pushbutton zeroing, and can measure movement continuously to any other point. Dial graduations are in increments of 0.002 in. and the range per revolution of the pointer is 0.500 in. A revolution counter is divided into ten segments, each of which represents one complete revolution of the large hand. There is no need for the operator to hold scales, adjust dials, or to master against gage blocks.

The Distometer is mounted on the lathe carriage so that it travels with the tool. It is actuated by its movement along a stationary tape mounted rigidly to the lathe bed. The Distometer is equally effective whether cutting shoulders, grooves, or bores. In on the job tests, the use of the Distometer actually increased lathe production more than 27 pct. Mainly responsible for the increased output was a better than two to one improvement in indexing time which included manual return of the tool and adjustment for depth of cut as well as actual measurement of length.

Using the Distometer, the operator was able to do his indexing in only 39 pct. of the time he required when using a long-range Dial Indicator and hand-held scale. Federal Products Corp.

Circle 40 on postcard for more data

Full View Grinding

New design in the manufacturing of disc type abrasives for metal working operations has resulted in a disc that enables the operator to actually see the section as it is being ground. The disc is shaped rectangularly and has a large radius at each corner.



As the disc rotates a full inch at its outer edge-the area where the grinding is done-becomes transparent. This feature is said to reduce excessive grinding or dwell time by confining the operation to the exact spot where it is needed. Behr-Manning Co.

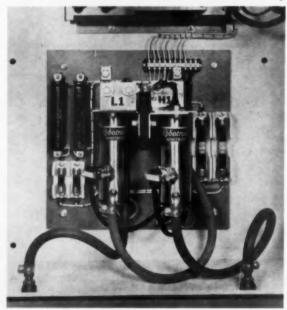
Circle 42 on postcard for more data

New Welding Unit for Automobile and Aviation Industry

A new welding control and power system that combines all the advantages of normal resistance, capacitor discharge and percussion welding with none of their inherent disadvantages has been made available to industry by Robotron Corp., manufacturers of industrial electronic controls.

It will be publicly demonstrated to industry for the first time at the Great Western Exhibit Center, Los Angeles, Calif., during AWS Welding

Circle 41 on postcard for more data



New Finishing Shapes

Bonded shapes for abrasive tumbling have been introduced in two new shapes. These shapes have been designed to barrel finish intricate parts such as grooved or serrated machined pieces. The new pins are available in round or triangular shapes. Norton Co.

Circle 43 on postcard for more data

Torque Testing

Designed to rapidly load and read out the actual "break-away" value of torque wrenches of any design, the model TWC-139 torque-wrench calibrator uses a conventional proving ring as a load measuring standard. For most torque-wrench designs, operation is automatic. The wrench is inserted in the mechanism, and load links and range of the electronic digital counter are set for the correct range. The tang is rotated by a hydraulic piston and cylinder assembly. At the break-away point of the wrench, the counter displays the



torque value in either lb, in. or lb ft. The digital counter translates the

linear displacement of the proving ring into torque values with a calibration accuracy of 0.4 pct of full scale. It can calibrate torque wrenches with capacities from 20 lb in, to 2000 lb ft.

An adjustable thrust arm can be positioned for any usual length of torque wrench, and four interchangeable socket inserts accommodate standard wrench tangs.

Dial or clock-type torque wrenches that do not "snap" at the set torque cannot be checked automatically on this unit but they can be manually calibrated. Accuracy is not impaired by manual operation and calibration can be accomplished quickly. Steel City Testing Machines, Inc.

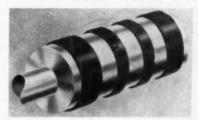
Circle 48 on postcard for more data

Teflon Piston Rings

PILLED Teflon piston rings, offering all of the chemical and mechanical advantages of this versatile fluorocarbon resin, have been introduced by Garlock. The new piston rings are ideal for non-lubricated service to seal reciprocating, oscillating and rotary motion of both external and internal cylindrical surfaces against the leakage of liquids or gases. Matched filled Teflon rider rings are also available for use in conjunction

with the rings where long stroke or heavy pistons necessitate additional support.

The piston rings are made from specially processed carbon-filled Teflon which exhibits a low coefficient of friction. They have exceptional ther-



mal stability and are suitable for continuous service in a temperature range from -420 to 500 deg F. These rings are tough, abrasion-resistant and have the ability to imbed hard foreign particles without ad-

versely affecting the cylinder life or the ring itself. Mechanical strength and dimensional stability are excellent. Garlock Packing Co.

Circle 49 on postcard for more data

Precision Spindles

Designed for electrolytic grinding operations precision spindles that may be belt or motor driven, are available from 1 to 20 hp, with a speed range of 900, 1200, 1800 or 3600 rpm. They will operate from 50 to 3000 amp.

These spindles have built-in insulation and are equipped with a new fork type, cool operating brush assembly for transmitting low voltage amperage current to grinding wheel. *Pope* Machinery Corp.

Circle 50 on postcard for more data

Steering Shaft Ends Annealed in Single Operation

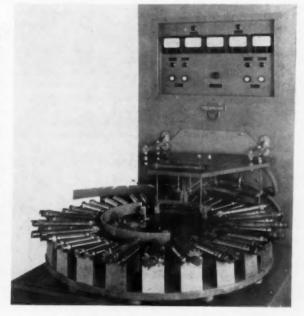
The work station is composed of a basic cast aluminum turntable upon which is mounted a number of aluminum cast frames which are jig bored and fitted with a set of steel rollers and gears. The rollers rotate the shafts dring the heat cycle to insure perfectly uniform results. As the parts rotate and travel around, they enter the work coil heating zone.

This zone consists of two semi-circular inductors in parallel, with special water cooled shorting stubs fastened to the larger rear inductor for the purpose of balancing the current distribution in each section and offset, or compensate for, the difference in mass of the ends of the part.

In this way, the threaded end is drawn to a hardness of Rc 32 and the slotted end to that of Rc 50, to reduce any tendency to break under shock. The entire part is carburized and hardened to give good metallurgical characteristics.

Circle 51 on postcard for more data

A major automobile manufacturer has just installed a semi-automatic induction heating machine which anneals both ends of a Gear Pitman Sector Shaft at the rate of 740 pieces per hour. This machine draws or tempers both the threaded and slotted ends of the shaft simultaneously. The entire system is designed and built in accordance with NEMA and JIC specifications. consists of a 50 KW, 10,000 cycle totally enclosed water cooled motor generator, its master control and work station, cabinet and semi - automatic tooling. This unit has designed built by the Induction Heating Corp.



PRODUCTION EQUIPMENT



The Model HP-25-E22, of 25-ton capacity, is equipped with a 2-hp. motor, has a ram speed of 28-in. per minute at no load and 12.2 in. at full load. The Model HP-40-E22, of 40-ton capacity, is equipped with a 2-hp. motor, has a ram speed of 17-in. per minute at no load and 8-in. per minute at full load. Acco Equipment Div., American Chain and Cable Co.

inductor ground detector is available to prevent damage to the inductor or gear in the event of misalignment.

These machines are being used to heat treat spur gears and pinions, helical gears, internal gears, and a new special adaptor is available for bevel gears. The tooth by tooth induction heating method hardens teeth from one tip through the root to the tip of an adjacent tooth. The highly stressed root zone is strengthened for greater load-carrying ability. Tooth faces are fully hardened for maximum resistance to abrading and pitting. Compressive residual stresses at the surface in the root greatly improves fatigue life. Ajax Magnethermic Corp.

Circle 53 on postcard for more data

Medium Capacity Electric Hydraulic Presses

Engineered to handle those tough and heavy-duty jobs requiring pressures of 25 and 40 tons, two mediumcapacity electrically powered hydraulic presses have been introduced to the trade.

Designed to easily handle, at low capital investment, the wide variety of press work demanded by industry, these units incorporate ease of operation and versatility with built-in safety and simplicity of maintenance. Frame members of these units are fabricated from selected structural steels for maximum rigidity and minimum deflection. All corners have been coped and ground to eliminate sharp corners and disagreeable contours.

Both presses are provided with completely enclosed hydraulic systems which prevent fluid contamination. Their hydraulic cylinders are constructed of cast steel for greater reliability and have been provided with machined shoulders to transmit loads evenly and squarely to the frame head channels.

The work tables, also fabricted from structual steels, provide a broad range of travel through utilization of an easily-operated, self-locking, screw-geared winch with a sealed lubrication system. These tables are supported and firmly held in position by four easily-removed, hardened steel pins.

Contact between the work specimen and the ram of the 40-ton press is made possible by rotating a convenient hand wheel which has been geared to a square-thread, Acme ramextension screw. This permits rapid approach to the work, makes the contact necessary for proper positioning, and reserves the full power stroke for the work being performed. The 25-ton model is not equipped with the wormscrew extension. The work specimen is contacted with an independent load arbor selected from a group of three such units provided with the press.

Circle 52 on postcard for more data

Custom Motor Line

A NEW line of precision, custombuilt motors in NEMA frame sizes have been designed for applications where a precision drive is a necessity. These motors are dynamically balanced to 25 millionths amplitude of vibration. Maximum shaft runout is 50 millionths of an in.

Motors are available in 1 to 20 hp



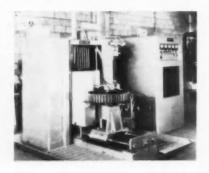
with speeds from 900 to 3600 rpm, and with straight or tapered noses. Permanently preloaded double row cylindrical roller bearings with tapered bores are mounted at the shaft extension end of the one-piece integral casting that forms the motor housing and base. The rear housing for the bearings locates permanently preloaded, angular contact bearings close to the rotor. This housing and extra large shaft and bearings provide the extreme rigidity required for a superprecision motor.

The motor pictured shows a precision grinding application, with a balancing type wheel holder. Provision has been made in the base for the mounting of a wheel guard. Pope Machinery Corp.

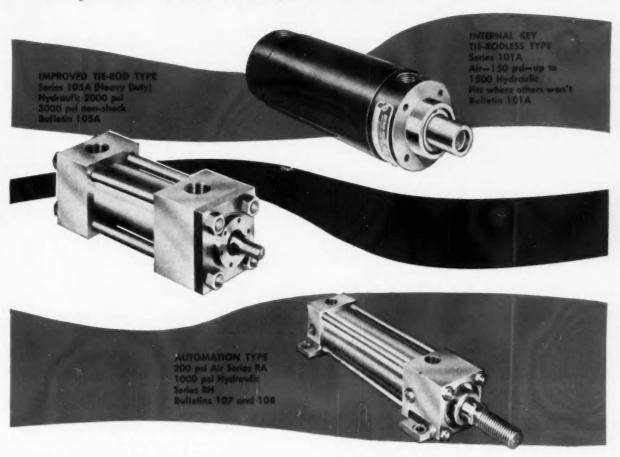
Circle 54 on postcard for more data

Gear Hardening Machine

A tooth by tooth gear hardening machine features complete automatic indexing and scanning and a pedestal with two hub adaptors, adjustable with lead screw and crank. This unit is now completely hydraulic with temperature compensated scan speed control valves. Cam bars for length of stroke and control of heat and quench are mounted on the front for greater operator convenience. An



O-M Cylinders Hold Every Stroke to a Close Tolerance



all O-M Cylinders meet JIC standards

Regardless of the bore size, diameter of rod, length of rod travel, type of mounting and position in which they are mounted, O-M Cylinders operate with high reliability and precision with every stroke.

Made of all-steel with bearing bronze; these force generating components take shock loads in stride, cushion piston shock and stand up under continuous cycling. In addition, they are sealed right, have the lowest coefficient of friction, make full power starts and require little maintenance.

Available in a complete range of sizes (1½" to 8" bores) with standard or heavy-duty rods, Complete line of mounts and interchangeable parts. Immediate delivery on most sizes, Mail Coupon NOW for descriptive Bulletins.



ORTMAN-MILLER MACHINE COMPANY 17 143rd Street, Hammond, Indiana

Send Bulletins	
101A	
105A	
107	
108	
NAME	POSITION
COMPANY	
ADDRESS	
CITY	ZONESTATE

Have representative call

The <u>thicker</u> the "Duplex Chromium" ...the longer the plating lasts

You'll now do more to increase durability of plated parts with a little more chromium thickness properly applied than with any other change in plating specifications. Results with M&T "DUPLEX CHROMIUM" confirm this beyond all doubt. There's dramatic improvement with 50 millionths of an inch. With 100 millionths it's downright phenomenal . . . and with 200 millionths, you have the finish of the future.

The graph shows this clearly. These are results with zinc die castings plated with identical undercoats but with different chromium topcoats. See the difference M&T "DUPLEX CHROMIUM" makes in durability. Note that the thicker the chromium, the longer the service life expectancy. Corrodkote accelerated corrosion tests show the same pattern of protection and durability.

Experience shows that the only suitable way to

plate thicker decorative chromium is with Unichrome SRHS® plating solutions. They make possible the correct type of deposit. They save production time. They simplify operations. And only with a combination of two of these baths can you produce M&T "DUPLEX CHROMIUM." Unichrome "Crack-Free" Chromium comes first, to block infiltration of corrosives to underlying metal. Giving more uniform plate distribution, this bath deposits ample thickness in recesses, with no graying on edges. A subsequent deposit of special Unichrome SRHS® Chromium then follows, to avoid localized corrosion at defects in the basis metal.

SRHS® baths and the "DUPLEX CHROMIUM" process can be adapted to most existing plating operations. Send for the M&T plating engineer to survey your plant requirements, or ask for literature.



plating products · welding products

coatings · metals · chemicals

METAL & THERMIT CORPORATION, General Offices: Rahway, New Jersey

HEW PRODUCTS

FOR ADDITIONAL INFORMATION, please use reply card at back of issue.

By C. J. Kelly-

Air Brake Device

A new safety valve has been specifically designed for application to the air brake lines of trucks and busses to prevent failure of the system in the event of a pressure loss. This valve automatically prevents malfunction by closing off a chamber that has been ruptured or a line that has been broken. This permits the



other brakes in the system to function effectively. The actuation of this device depends on the final pressure of the system rather than the high flow or leakage rate. The valve operates from 10 psi to maximum compressor pressure. It will operate with leakage rates as low as five cu ft per min, and is unaffected by vibration or road conditions. Known as the Hytrol, this valve is a dual diaphragm, pressure operated unit which may be connected to the brake lines for wheel to wheel, or axle to axle protection. Hydro-Aire Co.

Circle 55 on postcard for more data

Dry-Type Air Filter

New two-stage air filters—two filter elements in a single housing, with each element independently sealed—for both heavy duty automotive and industrial engines have been announced.

Company engineers emphasize that the air filter is a genuine two-stage unit because it actually embodies two separate elements, wherein one provides positive protection in the event the other is damaged.

The new dry-type air filters were specifically designed to meet the demand for more efficient engine protection where automotive and industrial type equipment is continually operated under abnormally dusty conditions.

According to the manufacturer both the first and second stage elements of the filter operate independently at 99.8 pct efficiency at all engine speeds. The second stage element's function is to provide continued engine protection in case the first stage, or working element, is damaged. If the first stage element and sealing gaskets operate at maximum efficiency before requiring service or replacement, the second stage element will last indefinitely.

The elements are made from a plastic impregnated cellulose with a new depth type radial pleating for greater dirt holding capacity. The porosity of the filter media for both elements is the "extra fine" type.

They are rated from 450 to 1150 cfm with an exceptionally low initial



restriction. Extensive field testing has proven that the advantage of having a low initial restriction will provide element life anywhere from 600 to 2000 hours continuous use. Purolator Products, Inc.

Circle 56 on postcard for more data

New Sealing Technique

A new technique for sealing waveguide components for use in highaltitude aircraft has been developed for the U. S. Air Force.

Using this technique, waveguide windows have been developed with a reflection coefficient of less than two and one-half pct over a band width of 40 pct for C, X, and Ku band waveguides. Low reflection over a wide band has been obtained by use of irises and recesses for compensation.

Made of glass-reinforced teflon laminates, the windows are bonded to the waveguide flanges with temperature-stable epoxy resin. The teflon laminates used in the waveguide windows are more desirable than other materials, because of their flexibility.

The newly developed waveguides can operate at high power levels at any altitude in a temperature range of -65 to 180 deg. C without the use of auxiliary pressurization equipment.

Armour Research Foundation of Illinois Institute of Technology.

Circle 57 on postcard for more data

Hydraulic Control Valve

A new hydraulic control valve with parallel internal circuit has been designed for heavy duty mobile equipment where rapid sequence of multiple functions is required. The new valve is available in two, three, four and six plunger models, recommended for 20 gpm at 2000 psi. Designated the V-33, this valve is a complete fluid power circuit with all required or extra circuit features built into a single compact package.

V-33 series valves may be furnished with built-in pilot operated overload relief valves on individual cylinder circuits as required. These prevent



damage from high static pressure that may be developed in a blocked cylinder circuit. Operating plungers may also be provided with built-in swing cushioning valves from boom control or built-in flow control and counterbalance valve. Hydreco Div., New York Air Brake Co.

Circle 58 on postcard for more data

Chrysler Imperial Quality at Work

(Continued from page 38)

4. The "hot room"—temperature and humidity are accurately controlled in this specially insulated room to check on the efficiency of operation of air conditioning units under varying temperature conditions.

5. Automatic leak detector or "sniffer"—the "sniffer" is an electronic device used to detect refrigerant leakage in air conditioning unit lines. If leakage is detected proper line adjustments can easily be made to correct situation.

6. Power steering checking fixture—this device checks on proper centering and evenness of torque of the power steering unit.

7. Front end and height alignment—each car is checked for front wheel alignment, and is also checked for proper height, front and rear.

In addition, a system of rigid control over incoming component parts and materials is regulated through modern inspection and testing procedures. (Continued from page 37)

FINAL ASSEMBLY O.K......DD-6 Inspects body for full assembly completeness prior to road test

MAJOR MECHANICAL REPAIR INSPECTION JJ-8 Checks for adequate repair of any major defects uncovered by quality station #31 that could not be handled on the moving line

PIT INSPECTION KK-14
Inspects all underbody bolts and
parts for completeness and tightness
PAINT 8

PAINT & METAL
INSPECTION LL-8
Inspects to insure that paint and
metal finish has not been damaged
and checks off all repairs made on
station #29 write-up

STATIC WATER TEST BOOTH...JJ-26 Sample inspects production cars to determine outgoing quality level, effectiveness of in-line test, what areas require further corrective action

LINE AIR CONDITION
CHECK .KK-16
100% inspects all functional aspects
of units to assure proper operation,
specified performance, and complete-

AIR CONDITION HOT ROOM JJ-16 Sample inspects air condition cars using a thorough climatized test. Booth runs at conditions as follows: up to 100°F. and up to 75% relative humidity at 100°F. This is to assure satisfactory performance of units under most severe weather conditions

FINAL CAR O.K... KK-8
Complete inspection of over-all car
clean-up and of all inspection cards
used for repair write-ups to assure
their being satisfactorily completed
prior to release for customer delivery

tion is achieved by an operator handling a speed control panel, designed for this purpose by Chrysler engineers. The fastenings joining the running gear to the body then are made up along the course of the line.

Meanwhile, wheels are painted and tires assembled onto the wheels, and wheel and tire assemblies are scheduled to the line for installation. Due to lack of overhead space, the wheel and tire assemblies are transported in flat position on the feeder conveyor, then transferred to a chute at ceiling height while still in flat position. Then they transfer to down chutes and roll to each side of the assembly line in the usual fashion. Even here Plymouth makes a departure from the conventional. Wheel installation is made by operators working in shallow pits on each side of the line. This carries the assembly very close to the hub center, making the manual transfer much easier and with less effort.

Following test procedures and acceptance from a mechanical standpoint, the cars are transferred to the 1900-ft long final assembly conveyor. All of the finishing operations—installation of glass, installation of headlining and seats, application of exterior moldings and trim, etc.—then are completed. Bodies go through the hurricane water test and are given their final inspection.

It is inescapable that some paint touch-up is always required on some cars and the Plymouth setup is no exception. Cars requiring repair are shunted off the lines and are transferred to the touch-up line which terminates in a drying oven. Here too we find a noteworthy transfer point. Cars come to the line on a floor conveyor which is joined by another floor conveyor carrying relatively flat dollies or trucks. The latter conveyor comes up under the floor at the junction point with trucks so arranged as to receive the car and transport it with wheels off the ground.

This junction too requires close synchronization of the two conveyor systems. The repair line conveyor coming up from under the floor is speed-controlled, with automatic synchronization of the two conveyors.

Austin Production Highlights

(Continued from page 49)

universal joints on either side of the differential housing.

Painted bodies are trimmed on three identical lines that feature a train of parts trolleys running parallel to each. For every body station there is a pair of trolleys, the leading one being coupled to an under-floor drag chain extending the full length of the line.

Like the trays or engine and gearbox assembly, they are fitted to take most of the required components, with glass and trim materials carried in the first, and electrical, hydraulic and mechanical units in the second. Trolleys are loaded from angled bins in the initial storage area, where scheduling instructions for trim and other optionals are received on a facsimile printer from a remote punch card transmitter.

Trimmed bodies are conveyed by slings on an overhead monorail to the dropping station on the final assembly line. There they are lowered onto the front and rear subframes which are correctly aligned by jigs before bolting to the body shell. This line is also scheduled for duplication in the future.

Plymouth Assembly

(Continued from page 46)

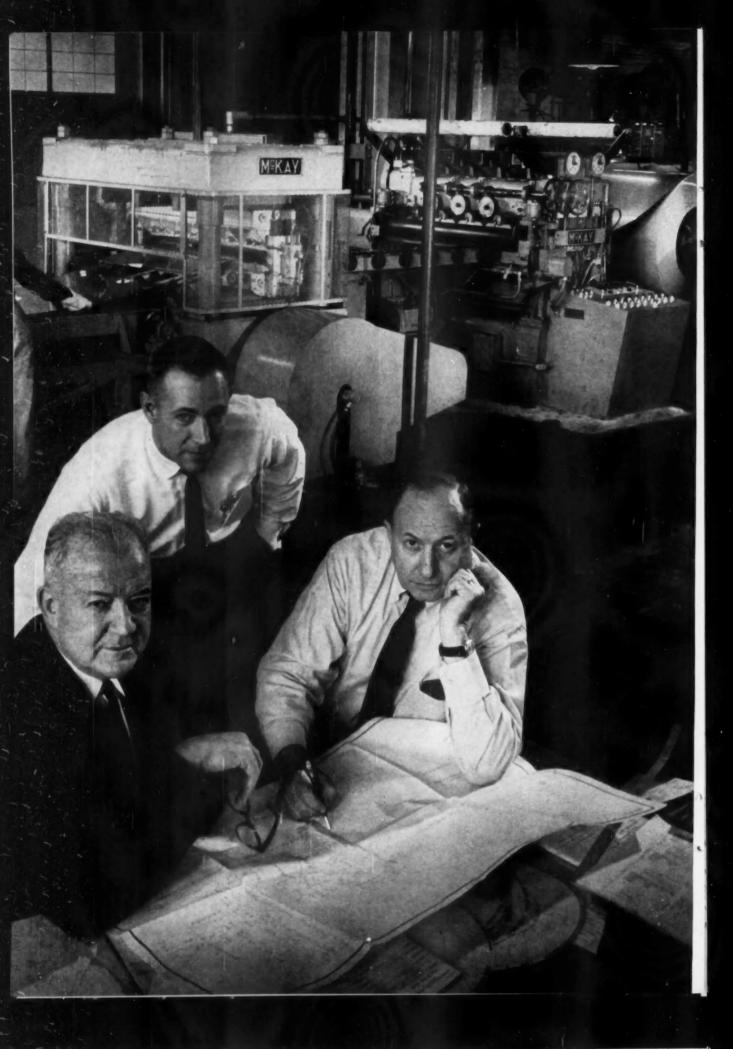
chronizing the speed of the two conveyors to effect accurate mating of the body over the chassis elements. To this end the body conveyor loop is controlled by means of a special d-c drive of infinitely variable type. Actual synchronizain 1960...

LOOK TO



FOR PROGRESS
IN METAL
PROCESSING

FOR EXAMPLE, the revolutionary new McKaymatic*
Die Shear Line that has reduced costs and cut scrap
losses for many steel makers, warehousers, and fabricators. For the complete story on one of these — Eastern
Stainless Steel Corporation—please turn the page.



Revolutionary
New McKaymatic*
Die Shear Line
boosts production
... cuts scrap loss
for Eastern
Stainless!

Photo by Arnold Newman shows (seated left to right) W. F. Schneid, vice president—general manager, and H. J. Verner, chief engineer of Eastern Stainless Steel Corp., discussing cost reductions in stainless steel processing with (standing) McKay Machine sales engineer, Robert D. Lynn, in front of a McKaymatic* Die Shear Line recently installed in Eastern Stainless' cold strip department

"We consider the McKaymatic* the finest advancement in shearing to come along in a great many years," says W.F. Schneid, vice president-general manager, of Eastern Stainless Steel Corporation, Baltimore, Md. "We have reduced production time, cut our scrap loss, and have recorded an overall increase in department efficiency as a direct result of this new McKay die shear line," Mr. Schneid continues.

Eastern Stainless is a prime supplier of stainless steel sheets, strip and plates, for aircraft and missile parts, for food, chemical, paper and textile machinery and for architectural uses. It produces 25 grades of stainless steel in its own modern electric furnace facilities, and ships about sixty-six percent of it in sheet form.

Programs many grades instantly—Through improved roller leveler techniques, Eastern Stainless found it was able to instantly program many grades of sheet through its new McKaymatic* Die Shear Line. The line decoils, levels in a 17-roll McKay Roller Leveler, measures by electronics and cuts to length—replacing a cut-up, re-level, and re-square operation prior to boxing. Production of cut lengths has been substantially increased.

The result, they report, is cost savings. Says Mr Schneid: "As a result of our efforts to improve customer service, we installed this line to speed up production of these cut lengths. It has enabled us to break a production bottleneck for which there seemed to be no solution."

Line eliminates stretcher leveling—Mr. Schneid continued that production time has been reduced on sheets of five grades as a result of being able to eliminate stretcher leveling and re-squaring procedures. Also, he said, the scrap loss on re-squaring has been eliminated as the sheets are cut clean and square on the McKay line. Net effect of the installation was a definite increase in overall departmental efficiency.

H. J. Verner, chief engineer, remarked that the McKay roller leveler could process these grades of stainless, within its capacity, to flatness approaching that obtained from the stretcher method. He reported that the Die Shear Line is being used to prepare for shipping cold rolled sheet from 4" to 48" in width, up to .050" in thickness, and in lengths from 36" and greater at normal production speeds. He particularly likes the McKaymatic* Die Shear Line for its ability to handle high finish stainless without edge or surface damage.

Available in many sizes—The McKaymatic* Die Shear Line is available in sizes to accommodate most commercial widths. Composed of decoiler (with coil car, if desired), roller leveler, measuring device, and cutoff press, it satisfies most requirements for sheet length accuracy and squareness, flatness, edge and surface quality protection and output rate.

For short runs or long, the McKaymatic* Die Shear Line will better any other line in economy and efficiency. Whatever your cut-to-length problem, McKay Machine's engineers have a solution. Write for literature; send your specific needs for a quotation to McKay Machine Company, Youngstown 1, Ohio.

*TM

LOOK TO



FOR PROGRESS IN METAL PROCESSING

Circle 135 on Inquiry Card for more data

Steel Market Settles Down to the First Normal Period in Years. Rate of Shipments Expected To Be Good this Month. Years. Rate of Shipments Expected To Be Good this Month.

By William F. Boericke

Steel Operating Rate **Declines**

The drop-off in steel operations is advancing faster than expected. Business still is good but hardly measures up to the roseate predictions of the first of the year. Cancellations are increasing and requests for deferment are coming in. Some of this can be blamed on inclement weather in all parts of the country which has slowed construction work. According to IRON AGE the operating rate may continue in the 90's through April but in May or June it may run in the low 80's with a seasonal slump in the third quarter to 60-65 per cent

It's the hard sell now for steel salesmen. In some instances freight absorption is allowed and charges for extras are being trimmed.

No doubt some of the cancellations come from the fact that during the strike many consumers placed duplicate orders with different firms, believing that post strike demand would be so great that allocations would have to be made when the strike ended. In addition, considerable business was placed abroad. Foreign orders cannot be easily cancelled and buyers who had contracted for foreign steel have been obliged in some instances to offer the steel on the market for what it would bring.

Competition Within the Industry

Steel service centers find themselves in active competition with the mills which no longer are averse to accepting orders that would formerly have been referred to the service centers. Inventories

are rising at a slower rate while steel shipments are going out at a faster pace than incoming orders. Import business in steel products from foreign mills has dropped off although offerings of such products as nails and butt weld pipe are plentiful. Cold rolled and galvanized sheets are still moving in good volume but even for galvanized there have been a few requests for deferred shipment which has caused little concern. Stainless steel prices are under pressure.

Steel Scrap in **New Market Phase**

Steel scrap is in poor demand. One reason is that overall scrap inventories at the year end stood at a record high level. During the strike period dealers accumulated material, hoping that when operations were resumed that scrap prices would climb, repeating the aftermath of the 1956 steel strike. But history did not repeat and the time-honored correlation between scrap prices and steel operating rate seems on the way out. In other years scrap prices have been highly volatile. Now the aim of the consumer is to buy a steady volume at a more stable price. Scrap dealers appear willing to work more closely with consumers with regular deliveries, and to avoid speculative excesses that used to characterize the market.

What Price for Steel?

A leading steel executive in his annual report to stockholders declared that the steel price must rise. Assuming a wage increase of 39 cents over the 30 months of the new contract with about 16 man hours to produce a ton of finished steel, costs would increase about \$6.50 per ton by the end of the contract period with incremental

costs of material and supplies about \$3.25 additional, or say \$10 per ton overall. This would increase the average cost of finished steel now priced about \$150 per ton by 6 per cent. It may be that increased productivity could take care of this without necessitating a price rise but no one is overconfident of

Smelters Cut Copper Price

As was widely, almost universally, expected the smelters reduced their price in mid-March from 35 to 33 cents a pound, bringing it in line with that established by the producers. For weeks the 35 cent price had been nominal. The question now arises-can the 33 cent price be maintained? There is little doubt that the producers will make every effort to hold it. But an impartial survey of the situation offers no certainty that the price may not decline to 30 cents before summer.

There are several factors that could upset the market. Paramount is the undeniable increase in copper output foreseen over the next few months. It was emphasized by the president of Phelps Dodge that some restraint in world output will be necessary if the industry is to avoid excess stocks and unstable prices. If the smelters cut below the producers price the independent fabricators will think twice before placing their orders at a higher price with the producers. This could then place the producers' captive fabricators in an uncomfortable position to buy their refined metal at a higher price than their competitors. In consequence, it might follow that the producers would be obliged to reduce their price to the smelters level.

LONG TON OF BUT

PRODUCTION FACILITIES INCREASED TO MEET CONSTANTLY GROWING DEMAND

There have been many elastomers developed since the first commercial ton of Butyl was used in 1943, but no other rubber, synthetic or natural, offers so many outstanding properties for so many applications.

Plant expansion plans announced recently will

increase butyl production capacity some 50 percent by 1961 and, at today's rate of consumption, the two million-ton mark will be reached within the next six or seven years. Two new additions to the butyl product line, Chlorobutyl and Butyl Latex, will soon be available in commercial quantities.

VERSATILE ENJAY BUTYL'S OUTSTANDING PROPERTIES MAKE IT SUPERIOR TO OTHER RUBBERS FOR MANY APPLICATIONS. SOME ADVANTAGES:

- RESISTS TEAR AND ABRASION ... used in the new and revolutionary all-butyl tire.
- STANDS UP AT HIGH TEMPERATURE ... used in steam hose and tire curing bladders
- HAS EXCELLENT ELECTRICAL PROPERTIES ... used in high voltage cable insulation
- **IS IMPERMEABLE TO GASES** ... used in virtually all rubber air-holding applications
- HAS WIDE RANGE OF DYNAMIC PROPERTIES. ... used in over 100 applications on the modern automobile
- DISPLAYS OUTSTANDING CHEMICAL RESISTANCE... used for the storage and shipment of many chemical and commodity products
- WITHSTANDS EXPOSURE TO SUN AND WEATHER ... used in irrigation pipe and roof coatings.

Want to find out fast, how versatile Butyl can improve your product? Call or write the nearest Enjay office.



EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY COMPANY, INC.

15 West 51st Street, New York 19, N.Y.

Akron · Boston · Charlotte · Chicago · Detroit · Los Angeles · New Orleans · Tulsa · Toronto

AIRBRIEFS

By R. RAYMOND KAY

You've read a lot about layoffs, cutbacks, and cancellations in the aircraft-missile industry. They make the front page—and always rock the industry. But it takes them in stride.

What's the status today? Here's a fresh look at one of the nation's largest employers. The industry shells out paychecks to 700,000 persons.

Aerospace companies will have a good year. Why?

(1) The industry is sitting with a \$12 billion backlog. There's over \$10 billion earmarked for aircraft and missiles in the fiscal 1961 budget.

(2) New missile orders are coming in at a fast pace. A missile speedup is in the making.

(3) Democrats are making hay with the missile lag. And they're sure to keep up the pressure for more defense funds.

No matter how the great Washington debate on defense comes out, the aircraft-missile industry will do well.

To be sure, military aircraft production will be down. But to offset this, the bulk of Boeing's 707s and Douglas DC-8s on order will roll off the assembly lines this year. These planes cost over \$5 million each. Convair and Lockheed are also in there pitching for sales of commercial airliners.

The immediate outlook remains good. But for the long run, the major companies know that they must develop new markets and new products.

Contract Talk Time

It's contract talk time in the aircraft-missile industry. Most of the major companies are sitting down with union officials to hammer out new contracts. The outcome will affect every employee—union and non-union—who draws a paycheck from the industry.

The International Assn. of Machinists and the United Auto Workers have a package ready. It's hard to put a price tag on it. But best industry estimates say the union demands run to about a 35 cent to 38 cent per hour increase. That's over a two-year period.

Aerospace Industry Trends

The aerospace industry get the highest percentage of all defense spending during fiscal 1959.

Most of the companies paid out about 50 cents of every dollar received to their first tier subcontractors. Small business firms got 35 cents of these subcontract payments.

Here's a list of the top 10 military contractors:

	(In
	millions)
General Dynamics	. \$1,616
Boeing Airplane	. 1,167
North American Aviation	. 1,018
General Electric	. 914
Lockheed Aircraft	. 899
Douglas Aircraft	. 676
United Aircraft	. 538
The Martin Co	. 524
Hughes Aircraft	. 494
American T & T	. 477

Pentagon planners keep changing the fortunes of the defense contractors. Recently, Lockheed got one-half-billion dollars in orders for the Discoverer, Midas, and Samos satellites. When fiscal 1960 figures are released, it's a pretty good bet that most of the above companies will remain in the top 10.

Interesting note: West Coast companies dominate the list.

Biggest portion of General Dynamics \$1.616 billion went to its southern California divisions: Convair-San Diego, Convair-Astronautics, Convair-Pomona.

Boeing, North American, Lockheed, Douglas, and Hughes are all based on the West Coast. Others of the top 10 have plants in the Far-

Three-D X-Rays

Engineers at Convair-Astronautics now use stero-radiography. It gives a big boost to the firm's reliability program on the Atlas missile.

What's stereo-radiography? It's a technique for three-dimensional study of x-ray films. James L. Minos, Convair-Astronautics engineer, says, "The use of stereovision allows us to detect minor flaws in internal components which might not be discovered using conventional x-ray examination."

Size range of parts for examination: from an eraser tip to a 290sq-in. cross-sectional area.

Brief Airbriefs

A recoverable space research test sled can travel up to 2700 mph in one and one-half seconds. It's been delivered to the USAF by Northrop. . . .

There's talk that Lockheed is testing a new small helicopter. . . .

Engineers at Aerojet-General Corp. believe that some day space engines, powered by liquid hydrogen and liquid oxygen, will produce 10 million pounds of thrust....

A new flow-turn machine that will make record size one-piece, high-strength, weld-free rocket and missile cases is now in place at an airspace company. . . .

Research and development takes 60 cents out of every dollar spent on an intercontinental ballistic missile project.

Columbium steel...

solves stamping problems



The cold formed stampings illustrated above are made from Great Lakes' Steel Corporation's GLX-W series of columbium steel. It clearly demonstrates the possibilities that are available to designing engineers. Here can be found high yield strength, with its possible weight reduction, good weldability and satisfactory impact properties. To be able to cold form these parts demonstrates the excellent properties to be had and points to possible production savings.

Molybdenum Corporation, through its own basic research and in close cooperation with various steel companies, has pioneered in the application of columbium to flat-rolled steels. For technical assistance in adapting these steels to your production, consult direct with your steel supplier or address your communication to MCA. No obligation, of course.

MOLYBDENUM

2 Gateway Center

CORPORATION OF AMERICA

Pittsburgh 22, Pa.

Offices: Fittsburgh, Chicago, Los Angeles, New York, San Francisco Sales Representatives: Brumley-Donaldson Co., Los Angeles, San Francisco Subsidiary: Cleveland-Tungsten, Inc., Cleveland Plants: Washington, Pa., York, Pa.



WELDING - Part IV

(Continued from page 43)

welding variables, automatic joint following, and automatic cycling (including provisions for crater filling and special starting and stopping conditions).

The important factor of "reliability" particularly will not be overlooked in resistance welding technology of the future. Indicative of the progress already made in this direction is the recent an-

nouncement by The Budd Co. of an electronic spot welding control (see AI, Dec. 1, 1959). It promises to improve substantially the reliability and consistency of resistance welders.

All in all, though, the outlook for resistance welding hinges more on industry's growing acceptance of the process than it does on technical development; in most cases, this is more than adequate to fulfill present needs. It is encouraging to note that efforts to upgrade proper applications are beginning to show tangible results. The welding machine builder is destined to assume a role of even greater importance in this respect.

Acknowledgments

The author wishes to express his sincere appreciation to personnel of the following organizations for supplying information on and illustrations of resistance welding installations:

Air Reduction Sales Co.
American Welding Society, Inc.
Budd Co.
Federal Machine and Welder Co.
National Electric Welding Machines Co.
Precision Welder and Flexopress Corp.
Resistance Welder Corp.
Sciaky Bros., Inc.
Swift-Ohio Corp.
Taylor-Winfield Corp.
Welduction Corp.

A note of thanks is also due to the automotive manufacturers who furnished data on their welding equipment installations.

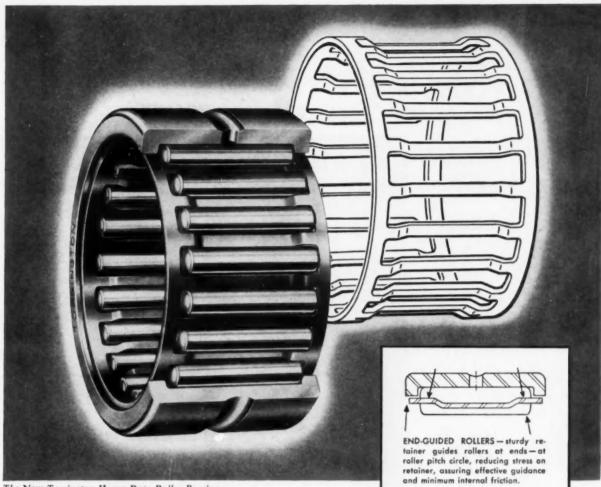
Part V of this five-part article will appear in an early issue of Automotive Industries.



Steady price levels are likely for the rest of this year. Only three months ago, government economists included warnings of higher prices in their rosy forecasts of boom business in 1960. It is increasingly evident now that prices—both industrial and consumer—will continue on a plateau for at least the next three quarters.

U. S. foreign aid, the State Department says, will go on forever. Officials say we must continue the aid program for "some years to come." The only change recommended is that we build up our foreign lending program. Until now, almost all aid money going oversea was in the form of handouts. Planners say we should now strive for a "balanced" aid program, including both loans and handouts.



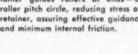


The New Torrington Heavy Duty Roller Bearing

Key to Long Life... Roller Guidance Where It Counts!

This sturdy flange-riding retainer in Torrington Heavy Duty Roller Bearings insures the highest degree of roller guidance where it's most effective...at the roller ends along the pitch circle. You get outstanding service life through minimum internal friction, high roller stability and efficient lubrication.

Controlled contour rollers prevent high end-stress concentrations. Careful heat treatment of the channel-shaped outer race insures high shock resistance. The Heavy Duty Roller Bearing has proved successful under unusual conditions of deflection or misalignment. Torrington Heavy Duty Roller Bearings are giving longer life in such difficult applications as two-cycle engines, hydraulic pumps, oilfield equipment, sheaves and transmissions. For design and application assistance on the Heavy Duty Roller Bearing-and every basic type of anti-friction bearing-call your Torrington District Engineer.





UNIFORM LOADING-Torrington controlled contour rollers eliminate stress concentration at roller ends. End-stress pattern of unrelieved cylindrical rollers is shown in black outline. Area in gray shows uniform loading over entire contact length of Torrington rollers.



AMPLE LUBRICANT STORAGE AREA is provided by the retainer design, which also allows unrestricted flow of lubricant within the bearing.

progress through precision

TORRINGTON

TORRINGTON COMPANY

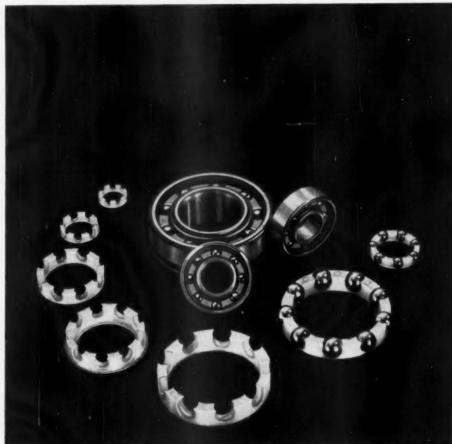
Torrington, Conn. . South Bend 21. Indiana

working with

Du Pont Zytel®

nylon resins

one of Du Pont's versatile engineering materials



How Du Pont

ZYTEL®

Retainers molded by Dreco, Inc., North Olmstead, Ohio, for The Green Ball Bearing Company, Cleveland, Ohio.

eliminates several difficult bearing problems

A new ball-bearing retainer, molded in one piece of Du Pont ZYTEL nylon resin, now eliminates several of the principal causes of premature bearing failure. Conventional retainers, fabricated from two halves of stamped steel riveted together, may fail because of burrs from the stamping, improper fits of the metal cups, rivet failure or lack of lubrication. And retainer wear may result in metal flakes that cause raceways to pit and then progressively break down.

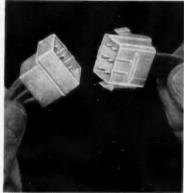
None of those problems is encountered with one-piece retainers of ZYTEL. The material has no burrs to interfere with the operation of the bearing surfaces. The molded parts fit properly. Lubrication requirements are not critical. The high abrasion resistance of ZYTEL resins makes retainers wear as well as the hardened steel balls and raceways themselves. Finally, the sound-deadening qualities of ZYTEL eliminate noise due to retainer vibration.

The unique design of these retainers takes advantage of several other properties of ZYTEL. The resiliency of these versatile resins, for example, permits ejection of the retainer from the spherical cores in molding.

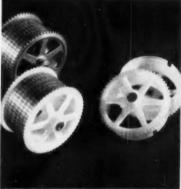
From the standpoint of manufacture, the new retainers are assembled much more readily than metal retainers. They are installed by a simple snap fit. Net cost savings result because of higher output, more uniform product and reduced number of rejects.

This is just one example of a component intelligently designed to take advantage of all the inherent properties of ZYTEL nylon resins. On the following page you will find more applications that may suggest ways in which ZYTEL can help you improve the design of automotive components.

Mechanical, electrical properties of ZYTEL® make possible cost-saving automotive designs



Electrical connectors made with Du Pont ZYTEL depend on the high strength and good dielectric properties of the material. Reliable connectors speed assembly of automotive components...help assurelong, trouble-freeservice. (Electrical connectors made by AMP Incorporated, Harrisburg, Pa.)



Sprocket for time clock illustrates the reduced costs and simplified assembly made possible by ZYTEL. This light injection-molded part has high strength and high fatigue-endurance limit. (Molded by Hamilton Plastics Molding Co., for the Cincinnati Time Recorder Co., both of Cincinnati, Ohio.)



Flexible coupling made of molded links of ZYTEL outlasts metal-chain coupling at least 6 to 1 and costs 20 % less to buy and maintain, according to the manufacturer. Coupling is clean, quiet, corrosion-free. (Molded by Berea Plastics Company, Berea, Ohio, for Morse Chain Co., Ithaca, New York.)

The factors of superior performance, greater reliability, simplified design and reduced costs, which have led to the widespread use of ZYTEL nylon resins in a host of industrial and consumer products, are, of course, particularly important in the field of automotive design. Find out how you, too, may be able to incorporate economy in your design with improved quality. The coupon below will bring you useful design data and information on specific automotive applications of ZYTEL.

ZYTEL® nylon resins

one of Du Pont's versatile engineering materials

Alathon® polyethylene resins

Delrin®

Lucite® acrylic resins



BETTER THINGS FOR BETTER LIVING ... THROUGH CHEMISTRY

E. I. du Pont de Nemours & Co. (Inc.) Advertising Dept., C-4, Room 2507Z Nemours Building, Wilmington 98, Delaware

Name

Street

Company_

Zone_

State

In Canada: Du Pont of Canada Limited, P. O. Box 660, Montreal, Quebec.

Al Machine Tool Survey

(Continued from page 64)

M-T Exposition

Question: Do you want to comment on the probable impact of the Exposition on machine tool business placed in the 2nd Half of 1960—or, in general terms, comment on the technological aspects of new equipment which will be revealed at the Exposition?

Durwood A. Blaisdell, executive vice president, The Baird Machine Co.—"In my opinion, the Machine Tool Exposition and the anticipation on the part of customers regarding new equipment to be exhibited, will have a somewhat adverse affect on new business to be placed immediately prior to the Exposition. Certainly, we hope that following the Exposition there will be an upswing in orders for the equipment we intend to exhibit."

Warren C. Oison, president, Besly-Welles Corp.—"I believe the Machine Tool Exposition will create tremendous interest in the many improvements and "efinements made in machine tools since 1955. This should result in orders for delivery in the 1st and 2nd Quarters of 1961 which possibly otherwise would not have been placed and may be highly valued at that time."

E. H. H. Graf, vice president, sales, Detroit Broach & Machine Co.—"As concerns the Machine Tool Exposition, I do not believe that it will materially affect the buying on the part of the large users, but certainly it should have a considerable impact in the smaller shops holding off to see what's new."

E. M. Hicks, vice president, Norton Co .- "Machine tool orders in the final Quarter of 1955 following the last Exposition were at an extremely high level. If this history is repeated this time, it will certainly have an effect on delivery schedules. Our own company follows the practice of announcing new machines as soon as they are ready for the market, and our display in Chicago will feature our current line, all of which is modern in design. There is no reason to wait and see the Exposition before placing orders."

J. P. Crosby, vice president, sales, The Lapointe Machine Tool Co.—"The startling improvement of production machine tools will alert the country to the advantages of a replacement policy of modernization of capital goods. The applications of tape control will be the most discussed aspect of the Exposition."

Edward P. Bullard, III, president, The Bullard Co.—"We expect some orders to be held up prior to the Machine Tool Exposition, and then increased activity."

The foregoing is an abbreviated version of a comprehensive report. Copy of the complete report, which contains additional comments from the machine tool builders, is available upon written request addressed to the Editor, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

Hy-Power by HANNIFIN 5,000 PSI HYDRAULICS

Proved by more than 25 years use in the Automotive Industry



BETTER THAN EVER TODAY



FAST . QUIET . POWERFUL ... EASY TO MAINTAIN



PRODUCTION TOOLS

Used on trucks, trailers, automobiles and throughout industry

Used for riveting, punching, pressing, marking and press-fit assembly

LIGHTWEIGHT PORTABLE TOOLS

GAP OR COLUMN PRESSES · POWER UNITS · CYLINDERS

STANDARDS AND SPECIALS

On use throughout the world

Call in your nearby Hannifin man—he's a trained production analyst—find out how you can do more at lower cost with Hannifin "Hy-Power."

Or write for our new Bulletin 150-A. It tells the whole story.

HANNIFIN COMPANY

543 South Wolf Road . Des Plaines, Illinois

- A DIVISION OF PARKER-HANNIFIN CORPORATION -

Index to Advertisers

This Advertisers' Index is published as a convenience and not as part of the advertising contract. Every care will be taken to index correctly. No allow-ance will be made for errors or failure to insert.

Acromark Co	0
Allied Research Prod., Inc.	12
Barnes Drill Co	67
Allied Research Prod., Inc. Barnes Drill Co. Bausch & Lomb Optical Co.	69
Rendix Aviation Corp.	
Products Div.	5
Bethlehem Steel Co	70
Rudd Co Automotive Div	6-7
Busewels Corp.	1.15
Burroughs Corp. 14 Cincinnati Milling Machine Co	10
Cincinnati Milling Machine Co	91
Classified Advertisements	71
Copperweld Steel Co.	
Aristoloy Steel Div	16
Crucible Steel Co. of America56	-57
Detrex Chemical Industries, Inc.	- 1
du Pont de Nemours & Co., E. I., Inc. 88	1-89
Polychemicals	88
Eaton Mfg. Co.	
Valve Div.	32
Enjay Co.	83
	65
Garrett Corp.	55
Gisholt Machine Co	
Globe Union, Inc.	63
Goodrich Chemical Co., B. F	21
Hall-Toledo, Inc.	86
Hannifin Co., Div. of Parker	
Hannifin Corp.	90
Heppenstall Co.	92
International Nickel Co., Inc.	2
Keuffel & Esser Co.	8
La Salle Steel Co.	9
M-K Machine Co. 70	81
McKay Machine Co	28
Mechanics Universal Joint Div	76
Metal & Thermit Corp.	
Minneapolis-Honeywell Regulator Co. Molybdenum Corp. of Amer.	30
Molybdenum Corp. of Amer.	85
National Machine Products Co	92
Ortman-Miller Machine Co	75
Parker-Hannifin Corp	90
Parker-Hannifin Corp	-54
Roebling's Sons Div., John A.	
The Colorado Fuel and Iron Corn	59
Shuler Axle Co. Back Co Southern Screw Co. Standard Oil Co. (Indiana) 2nd Co	WAR
Southern Serow Co	13
Standard Oil Co (Indiana) 2-1 Co	13
Standard Oil Co. (Indiana) 2nd Co	ver
Stevens Co., Inc. F. B.	58
Stewart-Warner Corp.	22
Torrington Co	87
Udylite Corp.	11
Udylite Corp. Universal -Cyclops Steel Corp 3rd Co	ver
Weatherhead Co	91
Wyman-Gordon Co.	60
	_
Classified Advertisements	
FOR SALE	

FOR SALE ELECTRIC RAM LIFT TRUCK FOR

HANDLING COILS. 20,000 LB. CAPACITY.

CAN BE CONVERTED TO FORKS. GOOD CONDITION.

ALSO, ELECTRIC PLATFORM TRUCK 20,000# CAPACITY

CALL MR. TELENZAK AT BALDWIN 6-1200, OR WRITE:

MOBILE INDUSTRIAL 9TH AND TIOGA, PHILA. 40, PA.

Out of town real estate: \$62.50 Total

Out of town real estate: \$02.50 Total Frice.
Fastest growing real estate market in U. S. 60 x 100 ft. undeveloped building sites in SUN CITY, TEXAS. 362 days sunshine a year. Only \$62.50 total cost, \$2.50 down, \$5.00 a month, no interest, no charge for warranty deed. 21 miles East of El Paso and Juarez, largest cities on U. S.-Mexico border. Just south of U. S. (Carisbad) Highway 62m adjacent to recently announced Horizon City. Convenient to Fort Bliss, White Sands Missile Range and Bliggs Air Force Base. Elevation 5,000 ft., gently rolling land. 60-day money back guarantee. Send \$2.50 check to

HARLAN E. O'LEARY (Member Nat'l Realtors' Ass'n.) DEPT. Y-3233 N. Piedras St., El Paso, Texas

WEATHERHEAD

offers unlimited design possibilities ONE SOURCE...ONE QUALITY

the finest in HOSE and HOSE ASSEMBLIES

hose assemblies

Weatherhead offers a wide selection of hose assemblies, bulk hose, hose ends (both permanently attached and reusable) to meet any and every O.E.M. requirement.

reusable hose ends

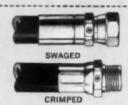


2-PC. STYLE

CLAMP-TYPE

permanently attached hose assemblies





Weatherhead perfected swaging and crimping machines permit O.E.M. production of quality per-manent hose assemblies at low, low cost. Write for information or

bulk hose

Over 20 different types for every industrial use. Standard hoses listed meet majority of needs.

H-17 (S.A.E. 100R3)

H-69 (S.A.E. 100R5)

Two-Fibre Braid. Medium Pressure. 560 to 1250 p.s.i. working pressure. 1/4" to 1" 1.D.

One-Wire Braid. Medium High Pressure. 350 to 3000 p.s.i. working pressure. 3/16" to 1-13/16" I.D.

H-9 (S.A.E. 30R2)

One-Fibre Braid. Low Pressure. 300 to 400 p.s.i. working pressure. $\frac{1}{4}$ " to $\frac{1}{2}$ " I.D.

H-25 (S.A.E. 100R2)

H-108 (S.A.E. 100R1)

Two-Wire Braid. High Pressure. 1250 to 5000 p.s.i. 1/4" to 11/2" I.D.

One-Wire Braid. Medium High Pressure. 1250 to 2750 p.s.i. working pressure. 1/4" to 3/4" I.D.

SIZES: 1/4" to 2" I.D. for PRESSURES up to 10,000 p.s.i.

BRASS & STEEL FITTINGS / HOSE & ASSEMBLIES / TOOLS & ACCESSORIES





THE WEATHERHEAD CO., FORT WAYNE DIVISION Dept. AI-4, 128 W. Washington Blvd., Fort Wayne, Ind. In Canada:

The Weatherhead Co., Ltd., St. Thomas, Ont.



Here are a few samples made to customers specifications. Our batteries of special high-speed multi-spindle, automatic machines make possible fast and accurate production of hexagon nuts of non-standard height and special shape from carbon or alloy steel, Naval bronze or other non-ferrous metals, also AN 310 through AN 335 as per latest Airforce specifications. Very often the special nut you require may be similar to one we are already making and a simple modification would result in a price advantage and quicker deliveries to you . . Send us your blueprint and particulars -let us quote on your requirements . . We also have a catalog that contains complete specifications, engineering data and prices regarding our standard nuts.

Manufacturer of Standard and Special *12 Pointer, Square and Hexagon Nuts ... "Huglock" and "Conclok" locknuts. NATIONAL MACHINE

PRODUCTS COMPANY 44250 UTICA ROAD MICH

Circle 142 on Inquiry Card for more data

THIS PRODUCTION LINE IS FASTER, SAFER, WITH HEPPENSTALL TONGS



Being pushed upward into the locked-open Tongs, this engine block will trip a mechanism causing jaws to automatically close.

Air operated lifts are an integral part of the engine block balancers used at Chrysler Corporation's Trenton, Michigan plant. When balancing is completed. the lifts push the blocks upward into Heppenstall Tongs; jaws close automatically, and the block is on its way to the next work station. At the same time, another pair of Heppenstall Tongs is bringing in another block for balancing.

Seventy-five of these 500-lb. capacity Heppenstall Tongs are used to handle 6-cylinder engines of the new Plymouth, Dart and Valiant. Another seventyfive Heppenstall Tongs, slightly different in design, handle V-8 engines on conveyor lines of Dodge, DeSoto, Chrysler and Imperial.

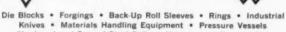
Chances are Heppenstall Tongs can help you more quickly and safely move materials, semi-finished or finished products. For more information, call your Heppenstall Representative. Or, send us your load and operating requirements for a quotation.

HEPPENSTALL COMPANY

Pittsburgh 1, Pennsylvania

PLANTS: Pittsburgh and New Brighton, Pa. • Bridgeport, Conn.

MIDVALE-HEPPENSTALL COMPANY Nicetown, Philadelphia 40, Pa.



Knives . Materials Handling Equipment . Pressure Vessels Hardened and Ground Steel Rolls . Vacuum and Consumable **Electrode Melted Steels**

IF IT HANGS FROM A CRANE . . . HEPPENSTALL CAN HANDLE IT

Circle 143 on Inquiry Card for more data

AUTOMOTIVE INDUSTRIES, April 1, 1960

Technical Literature

for your own

ENGINEERING LIBRARY

New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more Information on New Production Equipment and New Products described editorially in this issue

FREE POSTCARD INQUIRY SERVICE

Just circle the Numbers you want on Inquiry Postcards, and mail promptly

By C. J. Kelly

Engineering Data

Published to assist engineers, designers and production supervision. a six page recessing tool data file helps solve internal machining problems. Recessing, grooving, chamfering, undercutting, backfacing and necking are all covered in this file. All material in this file is cataloged for quick reference. Maxwell Industries, Inc.

Color-Sound Film

Drill point grinding is described in a new film available. It is a 16 mm film and takes approximately 10 minutes to view. It covers a machine that will handle drills from 0.032 to 1.500. Winslow Product Engineering Corp.

Tubing

Many types and shapes of tubing and its applications are described in a five section booklet. A breakdown of alloys manufactured is covered in chart style giving the nominal composition. Other products are also covered with charts and specification information. Wolverine Tube, Div. of Calumet and Hecla, Inc.

Control Systems

Digital recording and industrial control systems are described in a brochure that covers the applications and shows illustrations of these systems. Datex Corp.

Speed Reduction

Modern methods of speed reduction with compact, shaft mounted units in a wide range of sizes and horsepowers are described in a new 64 page bulletin. Construction details, dimensions and installation information are given in sections illustrated with photographs and engineering drawings. Dodge Mfg.

Electrode Selector

Electrodes for all industrial applications are described in a new 23 page catalog. It contains conformance to specifications information, and numerous charts that cover AWS grade and color markings, physical properties - (as welded), chemical analysis, general discription and competitive electrodes. This data was compiled to aid in the proper electrode selection for best weld, and strength. Metal and Thermit Corp.

Postcard valid 8 weeks only. After that use own letterhead fully describing item wanted.

COUR

No. 36

R D States

C A D

the

.=

4

ш

~

NESS R

B U S I S

POSTAGE WILL BE PAID BY

TOMOTIVE INDUSTRIE Village Station,

New York 14, N. Y. Readers Service Dept.

Village Station,

C S Stamp Z m

Necessary -Mailed 3 the

> States 0

S S 77 m ס _ ~ United 0 A 70

> Permit New York, N. Y.

FIRM

MAME

CITY OR TOWN FIRM ADDRESS **AUTOMOTIVE INDUSTRIES**

P. O. Box 66,

POSTAGE WILL BE PAID BY

only the describing item circled

36 36 36 36 76 76 116 1176 1176

18 58 58 78 118 118 118 118 118 118 118 118

199 199 199 199 199 199 299 299 20 40 60 80 100 120 140 160 220 240 continued . .

TECHNICAL LITERATURE

for your own

ENGINEERING LIBRARY

New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more information on New Production Equip-ment and New Products described editorially in this issue.

FREE POSTCARD INQUIRY SERVICE

Just circle the Numbers you want on the Inquiry Postcards and mail them promptly

Steel Tubing

Carbon and alloy steel grades of seamless tubing are covered in the eight page catalog, with illustrations, charts and specification data, offered by Seamless Tube Div., Copperweld Steel Co.

Welding Materials

A new, comprehensive catalog describes a complete line of welding electrodes, gas welding rod, non-consumable electrodes, submerged arc welding flux and automatic welding wire. In addition to a handy application diagram, specifications for each electrode are given-such as: description, color code, outstanding features, mechanical properties, conformances, size, current range and typical applications. A technical section covers information on AWS classifications and specifications. Hobart Brothers Co.

Pilot Relief Valve

Catalog file sheet number 1561-All describes a pilot operated relief valve that has been specifically designed for operation in areas where frequent maintenance is not practical. The capacity range of the valve is 30 gpm when offset and 20 gpm for in-line applications. Parker Hydraulics Div., Parker-Hannifin Corp.

Tilt-Cab Diesel

A brochure offered covers the description, specifications and requirements of a line of diesel cabs. Technical information and statistical data are included. Diamond T Motor Co.

Tractors

A new, 12 page catalog describes line of utility tractors and matched equipment that enhances the versatility of the line. Action illustrations, cut-aways and drawings are included. Allis-Chalmers Mfg. Co.

Steel Stamps

Scientifically designed steel marking stamps are described in a new booklet covering, with illustrations, all sizes and features available. The Acromark Co.

Engine Control

Latest production developments are covered in a new catalog that contains illustrations, charts and specifications of the line. Syncro-Start Products Co.

Zinc Die Castings

The use of zinc die castings in the new American automobile is discussed in an illustrated brochure published by the American Zinc Institute, Inc.

FREE LITERATURE --- USE THESE POSTCARDS

Furnace Data

Bulletin number 1081 describes and illustrates a line of gaseous and solid diffusion furnaces. Charts of technical specification and application as well as illustrations of the line are also included. Lindberg Engineering Co.

Roller Bearings

Dimension, load ratings and application data are covered in a twelve page brochure that describes cool running, high speed cylindrical roller bearings. Hoover Ball and Bearing Co.

Vacuum Metalizing

"Coating for Vacuum Metalizing" is the title for a new 45 page booklet that describes the process in detail. Application information on the dip, spray and flow coating operations is also given. Bee Chemical Co.

Pneumatic Valves

A line of pneumatically actuated control valves are described and illustrated in a new eight page bulletin. Operating characteristics and specifications are covered along with design and construction details. Conoflow Corp.

Engine Down Time

A six page piece of literature discusses the problems and time losses due to failure of power plants. Reconditioning hints are given also. Caterpillar Tractor Co.

Precision Indexing 20

A forty page catalog covers standard roller gear drive indexing mechanisms, high speed precision index tables, in line transfer machines and allied equipment. Complete load ratings, dimensions and installation data are shown in table form, including many new features. Ferguson Machine Corp.

Miniature Bearings

"How to reduce cost and eliminate overdesign of precision miniature bearings" is the title of a booklet aimed at the designer. It discusses the reduction of cost, bearing life and design features. Northfield Precision Instrument Corp.

Tooling Cylinder

15

compact, solenoid operated cylinder, for air, oil or water operation, are described and illustrated in six pages. This cylinder has a 11/4 in. bore and was designed for tooling and automation applications. The Sheffer Corp.

Welding Machines 23

A twelve page brochure dascribes 32 multi-spot and projection resistance welding machines in detail. Machines used, and setups for operations on automobile parts are illustrated and described. Such parts as engine head covers. engine oil pans, bumper guards and numerous other items are discussed. Special features of the line are given also: Automatic loading, inspection, special welding techniques, seam welds and other operations. The Taylor - Winfield

Designers Catalog

Power transmission belting of various types are covered in a 24 page catalog designed to aid machine designers and production personnel in choosing the belt to best suit their needs. Adaptability and recommendations are explained giving strength and specification data for the drive belts. Maurey Mfg. Corp.

Metal Treatment

Ultrasonic cleaning and rustproofing is the title of a new brochure that discusses the application of a suitable rust-preventive after cleaning operations. A technical description of rust-preventive products and their use is covered. Rust-Lick, Inc.

Belt Conveyors

Complete specifications, a detailed description of construction features, illustrations, and application information are covered in a twenty page bulletin about conveyor systems. The Joy Mfg. Co.

Metal Testing

Test devices that conform to ASTM standards are described in a booklet that shows illustrations and covers specifications. Testing Machines Inc.

Details of a new lightweight,

22

weeks only. After	weeks only. After	Affer	Affer	-	14 1054	-	OWB	effer	poal	descr	bing	tem ,	vantec	j.			4	9
40	end	me	furt	ther	info	orm	ation	uo u		the ii	tems	-	have	circ	ircled	bei	DW.	
					1	80	0		=	12		14	14	1	17		101	10
					27	28	20		3.1	33		2.4	200	2 5	24			4 '
					47	48	40		2 4	200		2 4 4	2 4	000	10		2	4 .
					***		1		21	30		t n	00	00	2		20	0
					10	0	00		/	12		74	75	76	77		79	00
					87	80	89		91	92		9.4	9.5	90	07		00	2
					107	108	109		111	112		114	115	114	117		110	5 5
122	123	124	125	126	127	128	129	130	131	132	133	134	125	134	127	330	100	7 :
					147	148	140		2 2 3	24		2 2 2	2 4 5	200	121		200	4
					27.5	240	27.0		21	70		104	001	200	101		129	9
					101	90	10%		17	172		174	175	176	177		179	18
					187	188	189		191	192		194	195	106	107		100	00
					207	208	209		211	212		214	216	216	212		010	9 6
					200	320	000		200	100		200	200	012	717		417	7
					1	244	477		22	797		434	233	230	237		239	24
					147	248	249		251	252		254	255	256	257		250	24
					267	268	269		271	272		274	275	276	277		270	0 0
					287	288	289		201	200		204	200	200	200		2/7	9 0
										4 4 4		474	273	240	147		7.7.2	5

122222222222222

ZONE NAME 20 YOUR FIRM

United States

in the

Mailed

م

ш *

S S R 2

Z

S

3

m 2

Stamp IU

Postage

2

4

No. 36

Permit

CLASS

25

OSTAGE WILL BE PAID BY

AUTOMOTIVE INDUSTRIES

Village Station, P. O. Box 66,

New York 14, N. Readers Service Dept.

AUTOMOTIVE INDUSTRIES

P. O. Box 66,

POSTAGE WILL BE PAID

continued . . .

TECHNICAL LITERATURE

for your own

ENGINEERING LIBRARY

New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more information on New Production Equip-ment and New Products described editori-ally in this issue.

FREE POSTCARD INQUIRY SERVICE

Just circle the Numbers you want on the Inquiry Postcards and mail them promptly

C Postage S Stamp Z m 5 Necessary S 77 4 m Mailed 70 _ 3 4 the United 0 D 20

States D

286

2044

2205

2006

299 699 109 1149 1149 1189 209

30 30 50 70 70 70 110 110 1170

7753197531

15 55 75 75 115 115 1175 1175

1975

39 39 79 79 119 119 1199

108 108 108 108 108 108 108

Auto-Torque Driver

A booklet is available describing a line of machines that drives screws and nuts automatically. Illustrations and charts cover the specifications of the line. Dixon Automatic Tool, Inc.

Pumps

Numerous illustrations, cutaway views and descriptive material covers a complete line of rotary positive displacement pumps, fluid motors and valves designed for industry. These units come in both standard and custom engineered models. Tuthill Pump Co.

Drill Head

A "quick change" adjustable drill head is described and illustrated in a new booklet that gives information on the specifications and features of the line. Drawings, charts and cut-away views complete the picture. Wisconsin Drill Head Co.

Boring Mills

A new 42 page bulletin describes a line of vertical boring mills with a range of capacity from 7 to over 42 ft. Included in the booklet are complete specifications and numerous illustrations. Optional features are also covered. Farrel-Birmingham Co., Inc.

Graphite Uses

Application of graphite to many phases of industry and the properties of graphite are discussed in a pocket size folder offered by the United States Graphite Co.

33

Steel Filters

Stainless steel filters are described in an eight page bulletin that gives typical set-ups, engineering data, method of manufacture, particle size removal, flow rates and important design and dimension information. Pall Corp.

Digital Computer 34

Product description, specifications and illustrations cover a line of digital computers. The many phases of industry where these machines can be employed is described. Mechanical Div., General Mills, Inc.

Die Design

A 210 page manual has been published by the ASTME titled "Manual of instruction for die design." The material was written by A. A. Vezzani, University of Michigan. This manual covers the use, construction and design of numerous types of dies. For information contact the ASTME on your company letterhead.

valid 8 weeks only. After that further 958 circled describing below. Ifem

send

FREE LITERATURE --- USE THESE POSTCARDS



STAINLESS . . . BEST FOR HARD KNOCKS



Thump it—rap it—scrape it! High strength stainless steel stays unscathed . . . stays unrivaled for body and fender protection. It's the *one* metal that completely meets the demands of today's quality-conscious, value-minded market.

And today, more and more fabricators of stainless trim and functional parts specify Uniloy for improved formability and product quality.
Call Universal-Cyclops for Uniloy Stainless Steel in the exact grade and finish you need.



STAINLESS STEELS . TOOL STEELS . HIGH TEMPERATURE METALS

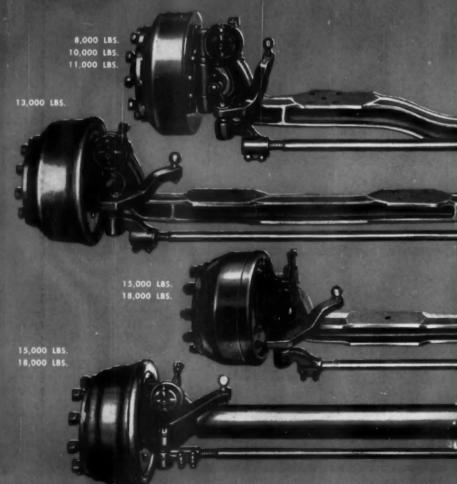
GET THE FACTS ABOUT HULER STEERING AXLES!

The toughest, sweetest-steering axles in the HEAVY-DUTY FIELD!

After "comparison" tests that leave no room for questions or mistakes, Shuler is now supplying STEERING AXLES for some of the best and bestknown makes of heavy-duty trucks, tractors and buses - for some of the

ruggedest earth-moving, logging and mining equipment in America.

Maybe you're missing a good bet! Full details and quotations gladly supplied on request.



SHULER AXLE COMPANY, Incorporated, LOUISVILLE, KENTUCKY

diary of Fuller Manufacturing Co Affiliate of Eaton Manufacturing Con

SALES OFFICESE CHICAGO, DETROIT, PHILADELPHIA, DAKLAND AND TULSA

